JOINT ARMY-NAVY INTELLIGENCE STUDY OF European U.S.S.R.

THE CENTRAL INTELLIGENCE AGENCY

October - 1947

JANIS 40
~~Confidential~~

THE CENTRAL INTELLIGENCE AGENCY

Washington, D.C.

1 October 1947

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3. When complete, JANIS 40 will comprise a text volume of 12 chapters (Volume 1 of 2), and a Plans Pouch (Volume 2 of 2). Contents will be as follows:

Volume 1 of 2. Text and illustrations.

Chapter I — Brief
Chapter II — Military Geography
Chapter III — Oceanography
Chapter IV — Coasts and Landing Beaches
Chapter V — Climate and Weather
Chapter VI — Ports, Shipping, and Navy
Chapter VII — ~~Transportation and Telecommunications~~
Chapter VIII — Cities and Towns
Chapter IX — Resources and Trade
Chapter X — People and Government
Chapter XI — Health and Sanitation
Chapter XII — Aviation (Limited-distribution supplement)
Chapter XIII — Gazetteer and Map Appraisal

Volume 2 of 2. Plans Pouch. Folded illustrations too large to bind.

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JOINT ARMY-NAVY INTELLIGENCE STUDY

EUROPEAN U.S.S.R.

BRIEF

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LIST OF EFFECTIVE PAGES, CHAPTER I

Subject Matter	Change in Effect	Page Numbers
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Text	Original	pp. I-85 and I-86
Imprint (inside back cover, reverse blank)	Original	unnumbered

TABLE OF CONTENTS

Note: The various topics of this chapter are based on information available in Washington, D. C., on dates ranging from 1 July 1946 to 1 May 1948.

(Table of Contents, continued, inside back cover)

FIGURE I-1
AREAS COVERED BY JANIS
JANIS 40
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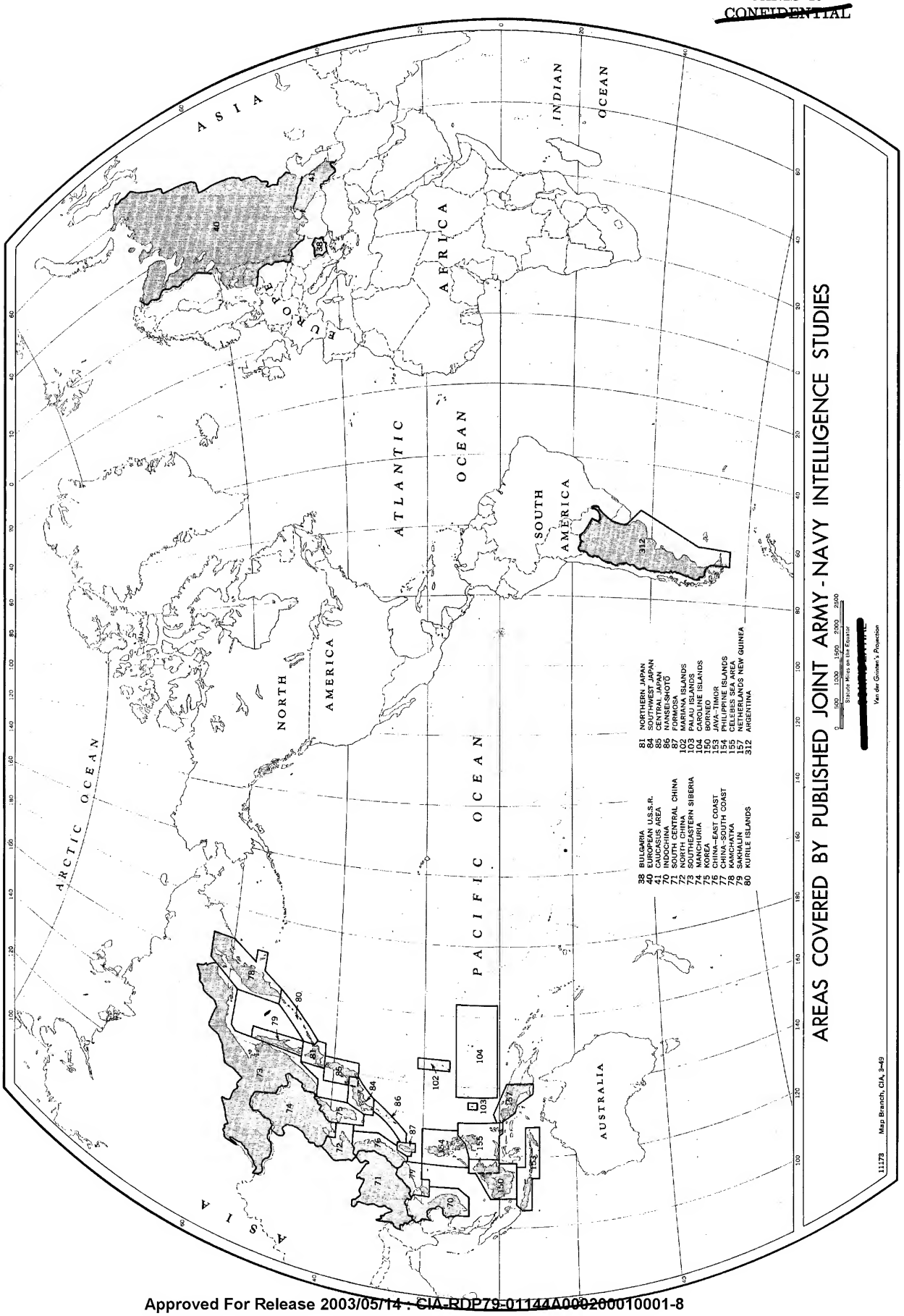


Chapter I

BRIEF

Prepared by Central Intelligence Agency from manuscripts submitted by chapter contributors

FOREWORD

The purpose of this study is to make available, subject to limitations of time and material, one publication containing all the necessary detailed topographic information upon which may be based a plan for military operations in European USSR. The study is intended also to provide an organized presentation of material to be used as a base on which to plot information from other sources.

The various topics of this study are based upon information available in Washington, D. C., on dates ranging from 1 July 1946 to 1 May 1948, as indicated in the respective chapters.

To meet the varied requirements of users, the material is presented in two distinct patterns. Chapter I, entitled "Brief," is a condensation of the material presented in much greater detail in the succeeding chapters. It provides a "quick look," complementing the main body of the study.

This publication has been prepared from material contributed by a number of agencies of the United States Government, including the following: Board of Governors, Federal Reserve System; Board on Geographic Names, Department of the Interior; Coast and Geodetic Survey, Department of Commerce; Corps of Engineers, United States Army (Beach Erosion Board; Board of Engineers for Rivers and Harbors; Engineer Research Division, Army May Service; Map Research Branch, Army Map Service); Deputy Chief of Naval Operations (Air), Department of the Navy; Director of Intelligence, United States Air Force; Engineer Intelligence Division, Office of the Chief of Engineers; Geological Survey, Department of the Interior; Headquarters Air Weather Service, United States Air Force; Hydrographic Office, Department of the Navy; Intelligence and Security Branch, Office of the Chief Signal Officer, United States Army; Intelligence Division, General Staff, United States Army; Joint Meteorological Committee; Medical Intelligence Branch, Office of the Surgeon General, United States Army; Office of Foreign Agricultural Relations, Department of Agriculture; Office of Naval Intelligence, Department of the Navy; Research and Intelligence organizations, Department of State; Weather Bureau, Department of Commerce.

Contents have been made up in two volumes; Volume 1, text, and Volume 2, Plans Pouch. A table of contents will be found on the inside cover of each chapter, and on the Plans Pouch. The text includes the following chapters.

NOTE: In view of the scheduled early publication of more recent and comprehensive basic intelligence on Transportation and Telecommunications and a more complete gazetteer, Chapter VII is not being issued and Chapter XIII consists only of Map Appraisal.

FIGURE I-1 shows the area covered by each JANIS.

CENTRAL INTELLIGENCE AGENCY

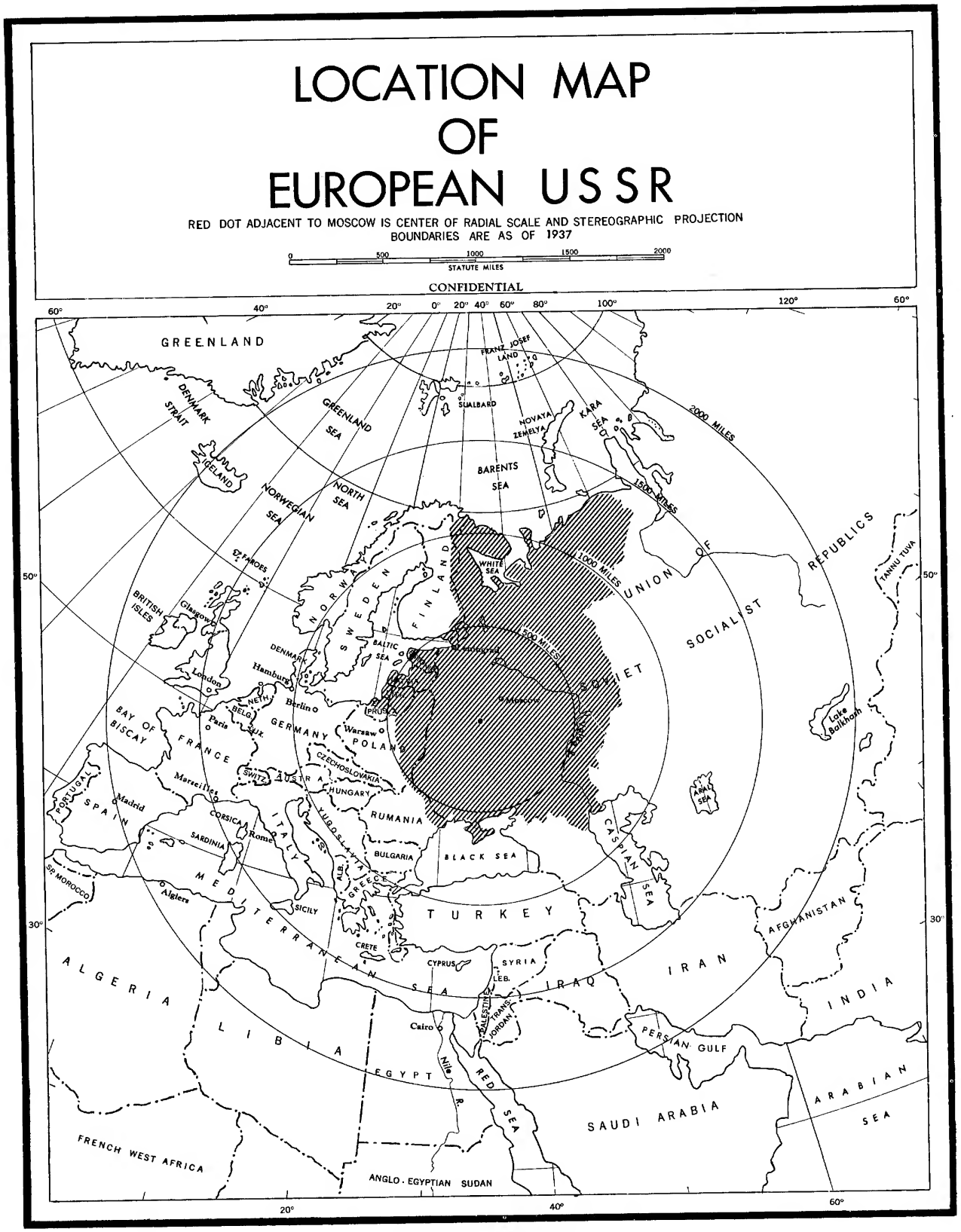


FIGURE I-2. *Location map*

1. INTRODUCTION

European USSR is the focal area of the Soviet Union. It is the seat of the complex and centralized governmental structure which dominates all phases of USSR life. It is the hub of the Soviet transport and telecommunications systems. Although occupying only about one-fifth of the total Soviet area, European USSR accounts for over one-half of Soviet agricultural production and, despite the eastward shift in the economic center of gravity, probably still includes at least half of total Soviet industrial capacity. The area has more than 70% of USSR installed electric power capacity. Its ports normally handle over three-fourths of total Soviet maritime cargo tonnage. The area is by far the most urbanized in the USSR, and approximately two-thirds of total Soviet population is concentrated in European USSR.

A. Physical characteristics

Surface configuration, climate, and soil are, with their reflection in historical development, contributing factors in the division of European USSR into three general regions.

Beginning above the Arctic Circle, the northern region extends south roughly to the 60th parallel in the vicinity of Leningrad. South of the permanently frozen tundra along the Barents Sea is the *taiga,* an extensive belt of forest land. Long and severely cold winters alternate with short but warm summers. The northern region has a sparse population, for the most part engaged in lumbering, fishing, hunting, and some mining. The land transport system is very limited; rail transport is primarily confined to the trunk lines from Arkhangel'sk and Murmansk to the south. The region is of major importance because of the port of Arkhangel'sk, western terminus for a warm-weather shipping lane through the Arctic, and the newer port of Murmansk, which is the Soviet Union's only ice-free northern port.

The central region, an industrial and population concentration centering around Moscow, extends from Leningrad south to about 51° latitude, and on the west now includes Estonia, Latvia, Lithuania, and prewar Finnish, East Prussian, and Polish territory. Summers are longer than those in the north but are still relatively short. There is a high density of population, which includes farm labor as well as industrial and office workers. The region is the hub of the Soviet rail, paved-highway and inland-waterway systems. Timber production and reserves are large. Prior to the eastward shift of industry, this region contained the bulk of Soviet industrial capacity and probably still holds a dominant position in general manufacture as contrasted with the heavy and extractive industries in the Ukraine and in the area of the Urals and beyond.

The southern region includes the Ukraine, the Crimea, and the western part of the steppe farm and grass lands. The climate and topography of the Ukraine are similar to the northern Great Plains of the United States and the province of Saskatchewan in Canada. The Crimea and the Caspian Sea coast are warmer and dryer than the Ukraine. The Ukraine, with large farm population and acreage, is a food surplus area. This region is also of major importance industrially. It includes the Donets basin's coal, considered the best field in the USSR, the extensive and high-grade iron reserves at Krivoy Rog, and related iron and steel production. The southern region, because of its mild climate, is a recreation center for the USSR. It contains the major Black Sea ports of Odessa, Sevastopol', and Rostov-on-Don; and the Caspian Sea port of Astrakhan' at the mouth of the Volga.

Extending eastward to the Urals and south from the Barents Sea to the Black Sea and the Caucasus, European USSR comprises 1,659,000 square miles, or approximately 20% of the Soviet Union's total area of 8,336,900 square miles. European USSR represents roughly one-half of the area of Europe and is equivalent in size to approximately 55% of the United States.

European USSR is the central part of the great, monotonous lowland plain which extends through northern Europe, and, after interruption by the Ural Mountains, eastward into Asiatic Russia. The nearly level to gently undulating terrain is generally less than 600 feet above sea level. A few districts within the plain have maximum elevations of 1,200 feet, but most of these rise less than 700 feet above their surroundings. Many of the major rivers flow at the foot of eastward-facing bluffs several hundred feet high, and erosion of these bluffs by streams and wet-weather gullies has locally produced a much dissected terrain. The major highlands of the area border the plain and do not break its continuity. The terrain is generally suitable for the construction of airfields, and for emergency use of frozen water surfaces and snow-covered areas. There are great expanses of marshes (the Pripet Marshes are notable), swamps, and lakes which affect cross-country movement. The area has an extensive network of rivers, many of which are 1,000 miles or more in length. Among the major rivers are the Western Dvina, flowing westward into the Baltic Sea; the Onega, the Northern Dvina, the Mezen', and the Pechora flowing northward to the Barents Sea; the Dnepr, Don, and the Dnestr flowing southward to the Black Sea; and the Volga, greatest of European USSR rivers, flowing southeastward into the Caspian Sea. Connecting the rivers are a number of canals, and it is announced Soviet intention to link Moscow, subject to ice blocking in winter and low water in summer, by navigable waterways with all seas bordering USSR. Vegetation ranges from the tundra type in the north, to the forests and cleared farming areas through the central region and the Ukraine, and to the desert vegetation in the Caspian lowlands.

The coasts of European USSR are divided into three widely separated sectors. The north coast is characterized by marshy tundra with frozen subsoil, or by high granite hills along the southern Barents Sea and rolling, forested, often marshy coasts along the White Sea; both areas have extensive sandy beaches fronted by shallow nearshore depths except along the Murman coast, which is rocky with obstructed approaches. Ice obstructs navigation most of the year except along the Murman coast, which is ice free but has granite hills fronting the irregular and inlet-indented coast. On the west coast the north shore of the Gulf of Finland is high and wooded, and the north coast of Estonian SSR is cliffy with approaches obstructed by islets and rocky shoals. The remainder of the coastal area is a flat plain with sandy beaches; approaches are generally clear; exit is often hindered by steep cliffs, marshy bay heads, or sand dunes. Along the Black Sea and Sea of Azov, the coasts are varied with low, marshy river deltas and estuaries fronted by shallows; extensive sand beaches frequently lie along narrow spits; whereas there are many short sand or cobble pocket beaches along the mountainous Crimean coast. Approaches are clear.

The climate of European USSR is strongly continental, with long, cold winters and short, warm summers. The climate is not so severe as in the comparable latitudinal zone of North America or Siberia. Variations through the

area are caused by latitudinal differences and the degree of proximity to the relatively warm currents of the North Atlantic rather than by topographic features. In winter, mean temperatures range from the middle thirties along the Black Sea coast to a few degrees below zero in the northeast, and in summer from the middle fifties to the middle eighties. Precipitation is low as compared with western Europe or the United States; it is heaviest along the Baltic coast and in the Ukraine. Except in the extreme south, all winter precipitation is snow, which covers the ground from October-November to April-May. From December to March in the south and from October to the last of May in the north, all water surfaces are frozen from a few inches in the south to over three feet in the north. Cloudy days and low ceilings are most frequent in winter. Minimum frequency of cloud and low ceilings occurs in summer with the exception of the Barents and White Sea regions where the average cloudiness exceeds 75% coverage throughout the year. Natural sources of water supply are plentiful in all parts of European USSR except in the extreme south and southeast.

Trafficability in most of European USSR is determined more by climate than by terrain. The most favorable period for cross-country movement is winter, when water surfaces and soils are frozen; the ice on Lake Ladoga was the supply route for Leningrad during World War II when land approaches were blocked. Spring thaws make conditions least favorable. From June to October surfaces are generally trafficable except during periods of excessive rain; in October-November deep mud covers most of the area.

Three key gateways from the west are through Grodno, L'vov, and Odessa. The Grodno route was followed by Napoleon in 1812 and by the central prong of the German advance in World War II.

B. Ports

The ports of the north coastal sector include the two principal ports of Arkhangel'sk and Murmansk. Arkhangel'sk, the principal export port, is closed by ice from 15 December to 15 May unless kept open by ice breakers. Murmansk, the only year-round Soviet port in the north, is a newer commercial port development, and also is an important naval center. There are five secondary ports and Molotovsk, a naval shipbuilding center which received lend-lease goods during World War II and may be kept open all year by the use of ice breakers. Lumber, chrome, magnesite, apatite, fish, and flax comprise the chief exports; coal is the chief import. Also in this area are the naval bases of Iokan'ga; Vayenga, chief operating base for the Northern Fleet; and Polyarnyy, headquarters for the Commander-in-Chief of the Northern Fleet.

The greatest concentration of important Soviet ports is in the western coastal sector which contains eight major ports and Kronshtadt, a fortified naval base from which the Baltic Fleet operates, seven secondary ports and the naval base of Oraniyenbaum. With the exception of Leningrad, Oraniyenbaum, and Kronshtadt, all of the western ports are in annexed countries. Leningrad, largest of the Soviet ports, is also the most important shipbuilding center in the USSR. Lumber, grain, and other agriculture products are the chief exports and the imports are coal and agricultural machinery. The Gulf of Finland is closed to navigation for more than three months, but most ports farther south on the Baltic Sea can either be entered all winter by ordinary vessels or kept open by ice breakers.

The south coastal sector contains five principal ports, including the primarily naval and military port of Sevastopol', and six secondary ports, all of which are open all winter, some with ice-breaker assistance. Odessa, the commercial and trading center of the Black Sea, and Mariupol', principal port on the Sea of Azov and next in importance to Odessa, handle the bulk of trade which includes grain, iron, manganese, oil exports, and imports of machinery and manufactured goods.

C. Transportation and telecommunications

Railroads move the greatest amount of traffic in the USSR; the Soviet policy is to emphasize freight transport and to reduce passenger traffic. The state-owned railroad network of European USSR in 1941 was approximately 41,600 miles, one-third of which was double-tracked. The prevailing gage of the track is the normal Soviet 5'0" broad gage; there are various narrow gages in the Baltic States and in USSR industrial use. Soviet railroad trackage density is greatest in the area centering around Moscow. Even in this area, the density of railroads is less than half that for the entire United States. Fifty percent of those lines within the invasion area were destroyed by the Germans. By October 1947, all the former double-track lines were reported restored as single-track, and some trunk lines were entirely or partially restored to double-track operation. Twenty-one strategic rail lines totaling 14,725 miles, of which 9,240 miles, or 63%, are double-track, form the framework of the railroad system of European USSR. These main railroads bolster the political integration of the country, connect important industrial areas and sources of raw materials, and provide outlets to the sea coasts and neighboring countries. Eleven principal rail arteries radiate from Moscow, linking it to all areas of the Soviet Union, including the ports on the Baltic, Black, Caspian, and White seas. A comprehensive number of branch and transverse lines interconnects the principal arteries.

Rail used on Soviet lines is generally of a poor quality and lighter than rail used in the United States; ballast is reported to be primarily sand. In 1941, the USSR had an estimated 27,000 steam locomotives of 19 types, most of which were much lighter and less powerful than those in the United States; some are obsolete. Of an estimated prewar total of 850,000 freight cars, which were almost entirely two-axle, approximately 50% were reported destroyed during the war; estimated freight car total in 1948 was 640,000 cars. Passenger cars are old and in poor condition. At the end of World War II, the whole rail network was in bad condition.

The Soviet roadnet of 1,042,000 miles is poor by western European and United States standards. In 1947, the principal highway system in European USSR consisted of short feeder roads to railheads and a radiating pattern of roads out of Moscow (seven of the eight principal roads) for varying distances. These seven roads, three of which are all-weather roads comparable to the better-type roads in western Europe, link Moscow with areas of industrial or military importance or are supply lines from important ports. The eighth road, between Astrakhan' and Kazan', is an important adjunct to rail and water transportation in the Volga region. Many areas are without improved roads, and many of the improved gravel or dirt roads are impassable at certain seasons. Spring is the roadless period; summer is the time of best trafficability.

The network of internal waterways in European USSR is formed by long, wide, well-distributed rivers. Although the low velocity of the rivers and relatively low elevation of the watersheds facilitate development, inland waterways have not been utilized as effectively in the USSR as

in other countries. Natural obstacles offset the advantages since all waterways are closed by freezing during the winter for a period from 70 to 200 days. During the summer and fall, low water necessitates extensive dredging. A plan to develop the rivers and to connect them by a system of canals has advanced about 30% toward completion. The longest and most modern artificial waterway is the Moscow-Volga Canal, completed in 1937. The lakes concentrated in the northwest, east and south of Leningrad, are linked by the Mariinskiy canal system and rivers to form an important outlet to the Baltic Sea. The most important dams are in the upper Volga and Moscow region; relatively few are necessary for navigation because of the level terrain, and most of the dams serve for power production. Reservoirs for irrigation are in the lower Volga area. The major river ports are those of the Volga-Kama-Oka system, on which are located the majority of the inland shipbuilding yards.

The pipe lines supplying petroleum to European USSR are inadequate in number and the older lines are in poor condition. Although the most important oil fields are connected by main or feeder lines to refineries or distribution points, the pipe lines transport only 25% of the extracted crude oil. New lines have been projected to supply Moscow and to reduce Caspian Sea transport of Caucasus petroleum. The longest and largest gas pipe line in European USSR is the 500-mile, 13-inch diameter carrier which transports natural gas from the Saratov fields to Moscow. Other gas lines are in the Kuybyshev, Groznyy, and L'vov areas.

The government-controlled telecommunications system is not dense in the USSR, approximately 0.75 telephone per 100 population in 1940, as compared with 16 per 100 in the United States; the telegraph system is more extensive. It is adequate for its purpose, however, since the main function of the domestic network is to provide official channels between Moscow and the various political subdivisions, factories, collective farms, etc., rather than to serve private communication. Radio is the principal means of international communication and is used domestically to convey Moscow broadcasts to the people by a wire distribution system.

D. People

European USSR has a population of 129,000,000, or about two-thirds of the total Soviet population, and an approximate density of 78 persons per square mile. This population has a higher birth rate and a younger age composition than the population of Western Europe and America. The area includes 80% of the key Slavic population of the USSR, of which the most important stock is the Great Russian, making up about 58%; the Ukrainian, which has constituted a dissident minority problem since the inception of the Soviet regime, a little more than 16%; and the White Russian, about 3%. The literacy, cultural, and political maturity levels of European USSR are far above those elsewhere in the country. The dominant religion, which is subject to major restriction by the Communist regime, is Christianity as represented by the Greek Orthodox Church. The area contains the bulk of the pool of labor skilled by Soviet standards, and has more than half of the estimated total Soviet industrial labor force. Workers are organized in large unions of the industrial type which primarily perform administrative functions and have a principal purpose of increasing production.

Urbanization is much more intensive than elsewhere in the USSR. This area has an estimated three-fifths of total Soviet urban area and six of the seven largest cities—Moscow, Leningrad, Kiev, Khar'kov, Gor'kiy, and Odessa. Prewar industrialization had resulted in extensive population shifts from rural to urban areas and brought about considerable overcrowding. As a result of war destruction and the fact that reconstruction has been slow, a large percentage of urban areas are seriously overpopulated. This is particularly true of Moscow and Leningrad.

The Soviet Union has exerted strenuous efforts toward the solution of its health and sanitation problems and has attained some measure of success. Medical and public health services are almost entirely state controlled and supervised. In 1941, there were 130,348 physicians, 661,431 hospital beds for general medicine and surgery, 73,992 for psychiatric patients, and 141,873 maternity beds. Water and sewerage systems, limited to the cities, are neither modern nor sufficient in number. Innumerable pests, such as disease-bearing insects, poisonous fish and snakes, and dangerous animals, are prevalent. The most common diseases are tuberculosis, malaria, venereal diseases, various types of enteritis and diarrhea. Typhus and dysentery are endemic. The state assumes responsibility for the production and distribution of food, and collective feeding is a widespread practice. Bread is the chief item in the diet; meat, fresh fruits, and vegetables are scarce in the cities but abundant in rural regions.

Moscow is the center for the political and administrative complex, dominated by the Stalin faction of the Communist Party, which maintains absolute control of the state. From Moscow issue not only the dictates and current propaganda themes of the governing administrative bodies and the Communist Party, but also the details of the *Gosplan* (State Plan) as they are transmitted down through successive administrative and regional levels to the smallest manufacturing or agricultural enterprise to the efforts, living standards, and ideology of each individual Soviet citizen.

E. Economy

Natural environment and historical development have made European USSR a relatively self-sufficient economic area. Agriculture occupies approximately 50% of the population; although the principal consuming as well as producing region, the area normally is self-sufficient in foodstuffs and has some surplus. It contains both coal and iron ore for the production of steel, large timber areas, extensive water resources for developed and potential hydroelectric power, a pool of manpower skilled by Russian standards, and industrial capacity ranging from steel mills to plants producing military end-items and precision instruments. A principal strategic deficiency is in petroleum, for which the area primarily depends on the Caucasus via the railroad, inland waterway, and pipeline systems.

Recent economic development and present operation of the economy in European USSR, as throughout the Soviet Union, is dictated in detail by the Soviet government for the purpose of increasing the military-economic potential in order to secure the USSR against "any contingencies." This policy rather than consumer needs determines the type and quantity of goods produced, and has a similar influence on both imports and exports. The state, through its planning commission, also directs and allocates the flow of commodities within the USSR from surplus to deficiency areas. The *Gosbank* (State Bank) is the center of the Soviet banking system. Operations of the other banking institutions are closely co-

ordinated with those of the Gosbank. Its function is not only to grant credit to an enterprise but also to ensure that the credit is used as planned and that the borrowing enterprise fulfills its quota under the plan.

European USSR bore the brunt of direct Soviet economic loss from World War II damage. German advances encircled Leningrad, made deep inroads on the agricultural and industrial areas westward from the outskirts of Moscow, and overran the grain area and industrial centers of the Ukraine and the Crimean peninsula. Industrial capacity was greatly reduced by German destruction, by Soviet destruction to deny production to the Germans, and by Soviet removal of production facilities to other regions, primarily beyond the Urals. Loss of plant was accompanied by dislocations in the labor force and in the established production pattern.

World War II damage, and the planned eastward dispersion of manufacturing and other economic enterprises which began prior to the war and has continued, have somewhat reduced the former economic pre-eminence of this area. A considerable strategic plant capacity has been developed in the Ural Mountains area and eastward toward the Pacific coast. Important new resources of essential raw materials have also been developed in these newer areas to provide basis for further development of industrial complexes. The new railroad construction outlined by the Fourth Five-Year Plan is projected almost exclusively for the area to the east. There is inadequate information for a close appraisal of the effect of these actual and projected developments on the relative significance of European USSR in the total Soviet build-up of industrial potential. Although much new capacity has been established in the Urals and beyond, particularly in the extractive and heavy industries, reduced productive capacity in European USSR as a result of war damage or removals has been largely, if not entirely, restored through reconstruction or through installation of equipment seized by the Soviets. In view of the existing availability in the area of relatively skilled labor, established transport, installed electric power generating capacity, and other supporting economic factors, it is doubtful whether the USSR could retain a substantial economic war potential if in major part denied the established productive capacity of European USSR.

2. MILITARY GEOGRAPHY

European USSR comprises 1,659,000 square miles, equivalent to approximately 55% of the area of the United States (excluding possessions) or about 50% of the land area of Europe. Roughly rectangular in shape, the area extends over 1,700 miles from the naval base of Sevastopol' in southern Crimea to the Polyarnyy naval base on the Arctic Ocean, and more than 1,300 miles from Klaipėda (Memel) on the Baltic Sea in the west to Sarapul near the eastern border of the JANIS 40 area.

The topography has an appearance of monotonous sameness. Perceptible differences in relief are local only. Elevations are over 1,000 feet only in a few small districts. Drainage pattern and characteristics are similar throughout the area. There are, however, large-scale differences in vegetation and in the capability of surface materials to support heavy traffic. These features generally divide European USSR into seven terrain regions (FIGURE I-3 and PLAN 2).

In this topic, reference is made to PLANS 2 through 10, which are folded illustrations too large to bind and are included in Volume 2, PLANS POUCH.

A. Relief

(PLANS 2, 3, and 4)

The most significant geographic feature of European USSR is the extensive plain with only slight relief in contrast to the rest of the European continent. Uniformity of relief is not absolute, however, because of the frequent alternation of lowland sections with more elevated and more strongly dissected sections, locally termed heights or hills. These eminences seldom rise more than 670 feet, minimizing the variation in relief.

One such break in this level-appearing plain is found in the Southwest Russian Upland, region C-2 in FIGURE I-3 and PLAN 2, which is deeply cut by numerous valleys 150 to 400 feet deep. Also, trending northwest – southeast across this upland is a series of granite outcrops which form a kind of elongated plateau, with elevations 900 to 1,100 feet above sea level and continuing as disconnected low hills as far south as the Sea of Azov.

In the central part of European USSR there is another series of uplands or elevated sections with a north – south trend. The northern extent is known as the Eastern Hills (region B-1c). Southward, successive parts are the South Valdai Hills (C-1c), with elevations from 650 to 1,062 feet; the Central Russian Hills (C-3b); and the Donets Hills (E-1d), where a maximum elevation of 1,220 feet for the series occurs southwest of Voroshilovgrad.

Eastern elevations known as the Pre-Volga Hills (C-3f and E-2b) are in reality a north – south trending plateau with elevation of about 1,000 feet above sea level. The plateau extends from Kazan' to south of Saratov and dominates the right bank of the Volga river either as high cliffs or as bluffs. In the northeastern part of European USSR are the Khrebet Pay-Khoy and the Timan Hills, each group consisting of a series of northwest-southeast ridges which do little to retard cross-country movement.

The major highlands of European USSR border the great plain and do not break its continuity. These highlands are the Ukrainian Carpathian Mountains (region D) in the southwest, the old and much worn-down Kola-Karelia Low Mountains (B-1a) and the rough and rocky land of Karelia (B-1b) in the northwest, a 300-mile segment of the Northern Urals (B-2e) in the northeast, and the southern mountains of Crimea (region F-1). All of these major relief features are considered "barrier frontiers" bordering the plain.

Elsewhere throughout the area there are wide expanses of level-to-rolling plain. There are also wide areas of swamps and marshes which affect cross-country movement. Despite the area's vast extent from the Arctic Ocean to the Black and Caspian Seas and from the Carpathians to the Urals, the plain retains its integrity and low elevation above sea level, with mean altitude of only about 550 feet.

B. Drainage

(PLAN 4)

The rivers of European USSR are typically long, many being 1,000 miles or more in length. They have low gradients (average 4.6 to 7.8 inches per mile) and shallow valleys. Many miles of their courses are bordered by marshes or swamps. The mountain borders of parts of European USSR have relatively little effect on the rivers.

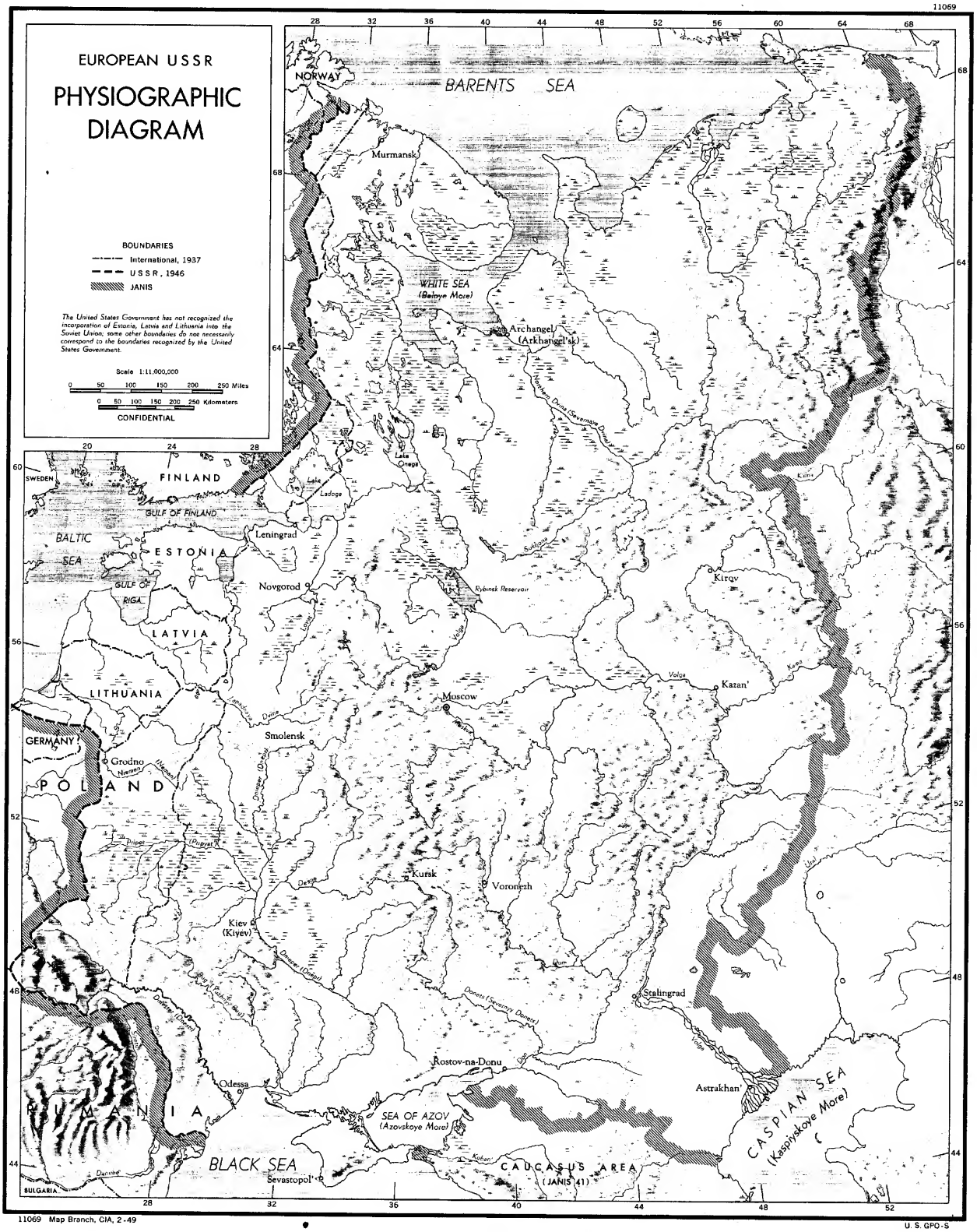


FIGURE I-3. *Physiographic diagram*

Several important rivers rise near each other on the flattish tops of the Valdai Hills and follow divergent courses. These radiating streams include the Lovat', which flows northward to the Gulf of Finland; the Daugava (Zapadnaya (Western) Dvina) flowing west to the Baltic; the Dnepr and Don whose courses are generally southward to the Black Sea; and the Volga, the greatest of European USSR rivers, which trends southeast and discharges into the Caspian Sea. Another flattish divide separates the northern tributaries of the Volga from the rivers flowing northward to the Arctic Ocean. Important among the latter are the Onega, the Severnaya (Northern) Dvina, the Mezen', and the Pechora.

So nearly level are portions of both of these divides that in the periods of spring flooding there is often a temporary sharing of water between the diverging streams. Canals have been built connecting various streams with adjacent head-waters, and Moscow is now connected by water to all seas bordering European USSR.

The area has a great number of lakes but they are unevenly distributed. The greatest concentration is in the Kola-Karelia lake region where the largest are Lake Ladoga and Lake Onega. In the grassy lands of the south the few lakes are insignificant in size except on flood plains where some areas submerged in spring floods remain as shallow lakes throughout the year. In addition, there are lagoon and estuary type lakes along the shores of the Black and Azov seas and the salt lakes in the Caspian lowlands.

Marshes border many of the lakes and connect them with adjacent water bodies. In the forested belt and northward, swamps cover wide lowland areas. Southward of the forested belt, most marshes are along the streams. It has been estimated that swamps and marshes cover about 6.8% of the total land surface of European USSR, the most extensive marshes being those bordering the Pripyat' river.

The main high water period is in the spring and early summer (April to June), following the melting of the winter's accumulation of snow. Streams overflow their banks at many places, extending the borders of swamps and marshes. Ground water is available everywhere, but in general it becomes deeper and more mineralized from north to south. Bordering the Arctic, for example, ground waters lie close to the surface, are almost completely lacking in mineral salts, and have a high organic content. On the other hand, ground waters in the Black Sea area lie at great depths (in part deeper than 1,000 feet) and on the whole are very hard, saline, or brackish.

During the cold season the water bodies of nearly all of European USSR are covered with a layer of ice. The ground is frozen or snow-covered and drainage is essentially at a standstill. The period of ice cover varies from less than two months in the southwest on the lower Dnestr to seven months in the northeast on the lower Pechora. Thickness of ice varies from a few inches in the south to over three feet in the north. Since a temperature below 32° F. is required for the freezing of salt water, duration and thickness of ice on the salt lakes and the Caspian Sea varies with salinity.

C. Vegetation
(PLAN 4)

The latitudinal extent and position of European USSR—comparable to that of the area from St. Paul, Minnesota, to beyond the Arctic Circle—give the area a wide variety of vegetation. Zonation in a broad sense is definite, with fairly wide areas of transition between zones. Vegetation ranges from the tundra type in the north to the Mediterranean forest in southern Crimea and to dry desert forms of vegetation in the Caspian lowlands. Forest and grass, however, are dominant.

For about 100 miles inland from the Arctic coast is the tundra. Most of the subsoil remains permanently frozen. This zone is similar to the Barren Grounds of Canada. The dominant vegetation consists of lichens and mosses. Toward the southern margin, however, are associations of berry bushes and sedges and also dwarf forms of trees such as birch, willow, and various conifers. Southward, but mainly north of a line from Leningrad to Molotov (formerly Perm), is a transition zone where the trees gradually become numerous and taller.

South of the Leningrad-Molotov line the growth of trees becomes dense and forms an immense forest of conifers mixed with birch. This coniferous forest belt, spreading across European USSR from west to east, extends southward for about 600 miles.

Farther to the south, but mainly north of a line from Kiev to Kazan', the dominant conifers are replaced by broadleaf trees such as oak, beech, ash, and maple. Here, except in the swampy district of the Pripyat' river, much of the forest has been cleared to provide cropland and meadows. Crops include small grains, flax, sugar beets, and vegetables.

Extending across the southern part of European USSR is a vast grassland (steppe) on which trees are either absent or rare. The grasses vary from tall feathergrasses in the north to shorter and progressively wider-spaced, tufted grasses in the south. Much of this region is now under cultivation.

West and north of the Caspian Sea, and on both sides of the lower Volga, the grasses become sparser and in places saline. There are also low growing wormwood shrubs common to desert regions. Only along the moist Volga flood plain are there trees, thick grasses and reeds. Cultivated areas are confined mainly to the flood plain.

The marginal mountainous parts of European USSR are mainly forest-covered. The trees include fir, pine, spruce, oak, beech, and chestnut. Above the timber line are mountain meadows and some areas covered with mosses and lichens.

D. Trafficability of surface materials
(PLANS 6 through 10)

The areal distribution of soil textural types and weather records giving the seasonal distribution of precipitation and the critical 32° F. isotherm in European USSR are the principal criteria for estimating the ability of surface materials in their natural state to support vehicles moving either across country or on unimproved roads made entirely of local soils, and in some instances to support troops, cavalry, and cargo animals.

The northern part of the country is covered with coarse-to-fine soils of glacial origin, whereas the southern part is covered with deep layers of fine-textured loessal, residual, and alluvial soils. In general, the surface of European USSR can be divided into four broad soil types. These are: 1) the well-drained sandy and loamy soils over unconsolidated materials which are trafficable at all times excepted during heavy rainfall, 2) the moderately drained deep, loamy and clayey soils over consolidated materials which are nontrafficable during and for a considerable time after heavy rainfall, 3) alluvial and other fine-textured soils that contain well- and poorly-drained soils

closely combined, and 4) poorly drained soils. The last two types are nontrafficable except when firmly frozen.

PLANS 6 through 10 give an over-all view of soil types and trafficability but cannot be relied upon for detailed information for any one place. Also, certain areas have local limitations on cross-country movement even though the trafficability maps may show them as areas of favorable drainage. Such areas include the Carpathian, Ural, and Crimean mountains, the Khibinskaya Tundra and the Lovozerskiye tundras, the gullied areas of southern USSR, the rocky portions of the north, the extensive bog and marsh areas of the west and north (PLAN 4), and the saline soils of the Caspian Lowland.

Trafficability throughout most of European USSR is affected more by climate than by terrain. Trafficability is poorest in the spring, at which time even improved roads commonly fail in spots. Steady melt begins about 1 March in the vicinity of the Black Sea and the melt period moves from west and south to the northeast. During this period little, if any, cross-country movement is possible. Another unfavorable period for cross-country movement is in October and November when alternate periods of freezing and thawing of the surface soil disrupt the normal soil-drainage before the onset of persistent freezing. Any precipitation and freezing temperatures during this period make for poor trafficability either through the formation of deep mud or frozen ruts which affect the use of vehicles.

Winter is the most favorable period for widespread cross-country movement. Surface materials are frozen deeply enough in normal years to support most military vehicles. Winter ranges from December to March in the south and from October to the latter part of May in the north. January is the coldest month throughout the country. During the season of continued frosts, depth of frozen surface materials varies from none in the extreme south to 40 or 60 inches in the central and northern areas. Maximum depth of frost penetration is highly significant because it is directly related to duration of nontrafficable conditions in the spring. For example, frost penetration of 6 inches may be associated with poor trafficability of only 2 to 4 days when thawing takes place, but frost penetration of 36 inches or more ordinarily results in nontrafficable conditions for 4 to 7 weeks (PLAN 10). Lakes, ponds, rivers, and most swamps freeze over during October and November and become trafficable until the spring break-up.

In summer, surface materials of European USSR are generally trafficable, although trafficability from day to day depends upon frequency, intensity, and duration of rain and upon the higher rate of evaporation. Even in summer, in such places as the Pripet Marshes, areas east of Leningrad, much of the northern forest and tundra belts, and on river flood plains, local routes must be chosen with care. Elsewhere cross-country movement should be feasible during summer except during or immediately after heavy or prolonged showers.

E. Military implications of terrain features

Insofar as the surface configuration is concerned, cross-country movement is feasible in most places. However, it may be prevented or retarded by: 1) the steep escarpments on the west banks of the large rivers, 2) the wide river flood plains bordering most of the streams, 3) an extensive network of deep gullies and ravines in the southern part, and 4) rock-strewn areas in the northwest.

Greater deterrents to cross-country movement than relief are: 1) the drainage net throughout the country, 2) the vast, poorly drained areas which are covered with bogs, swamps, and marshes, and 3) the numerous lakes in the west and north. However, the barrier effect of the streams and lakes is greatly reduced in midwinter when most are firmly frozen. In fact, the ice on Lake Ladoga was used as the major supply route to Leningrad in World War II when all land approaches had been blocked. The major rivers are serious barriers during the spring flood periods and temporarily in summer following any excessive rain. Both the Germans and the Russians crossed the Dnepr and Don after some preparation but relief irregularities and swampy bottomlands channelized all approaches to these rivers.

The slight relief throughout much of European USSR makes variation in vegetation of primary importance in cross-country movement, deployment, and concealment. In the north, the low moss, sedge, and scrub trees of the tundra offer few obstacles to movement and only limited possibilities for concealment and fuel supply. Southward from the tundra, the great forest belt, although interrupted by marshes, moors, and scattered man-made clearings, is a serious barrier or impediment to movement, and offers maximum concealment and an unlimited supply of wood.

In the transition zone between the forest belt to the north and the grassland to the south, movement would encounter alternating openings and wooded patches, and open areas can be covered from adjacent forested areas.

In the vast grassland belt, cover and concealment are poor. Concealment is possible only for crouching or prone positions.

From the standpoint of trafficability of surface materials, the most favorable season for movement is in winter (December and February) when most surface materials, including lakes and bogs, are firmly frozen. This is also, however, the period when low temperatures and snow hamper free movement because of their effect on personnel and equipment. Another favorable trafficability period occurs in summer (June to October) when most surface materials are dry. Least favorable periods for movement are during spring (March to mid-May) and autumn (October and November) when deep muds cover most of this area.

F. Natural features of focal areas

Focal areas of European USSR are the great urban commercial-industrial zones of Leningrad, Moscow, and Gor'kiy and the industrial-agricultural belt spreading from Kiev through Rostov-na-Donu (Rostov-on-Don) to Stalingrad. Areas which are important because of potential use as approaches to or bases from which to attack these major strategic regions include: 1) the Kola Peninsula (Kol'skiy Poluostrov), the coasts of the Gulf of Finland, and a broad belt connecting the two sections and 2) the so-called three southern gateways to the USSR — the routes through Grodno, L'vov, and Odessa.

The Leningrad, Moscow, and Gor'kiy zones are located in poorly drained planes broken by gently rounded hills of moderate elevation. Dense forests alternate with crop and pasture lands in the urban environs. The most trafficable approaches to these cities are the ridges which, although forested in many places, are well-drained and have few steep slopes.

The Kiev-Rostov-Stalingrad area lies within grass- and crop-covered, gently-rolling planes which are broken only by a high, steep escarpment on which Kiev is located and a dissected area of moderate height (the Donets Hills) northwest of Rostov. A few patches of trees grow on these hills and on the sides of the major valleys. This area of

deep, black earths is easily traversed when dry or frozen but quickly becomes an area of deep, impassable mud after heavy rains or spring thaws.

The Kola Peninsula area has many local sections of relatively level and firm land capable of utilization for the construction of airfields or landing strips. The peninsula lies almost on a direct air line between northeastern North America and the population and economic concentrations of European USSR.

The Tallinn area and similar sites along the Baltic coast constitute possible staging areas for operations against Leningrad and Moscow.

The Grodno gateway is the southwestern end of a series of sand and gravel hills which form an almost unbroken dry, gently-rolling, and partly-forested upland belt from the Polish border via Smolensk all the way to Moscow. This natural route was followed by Napoleon in 1812, and by the central prong of the great German advance of 1941.

The L'vov gate also marks the western end of a natural route provided by the central and nearly flat part of the Southwest Russian Upland. This gently-rolling, grass-covered upland belt extends almost in a straight line from L'vov to Kiev. The southern prong of the German invasion of 1941 followed this route.

A significant feature is the separation of the Grodno-Smolensk and L'vov-Kiev routes by the almost impassable Pripet marshes and swamps.

The Odessa gateway actually is divided into several sections along the north coast of the Black Sea east of the city. These sections of the coast lie between the large marsh-bordered estuaries and lead directly to low, gently rolling grass- and crop-covered lands which continue northward to the Kiev-Rostov area. The only natural impediments to rapid cross-country movement and wide maneuvering between the Black Sea coast and the Kiev-Rostov area are the Kiev escarpment and the Donets Hills, widespread networks of deep gullies, and belts of poorly drained land along the major rivers (Dnepr, Donets, and Don).

From the Kiev-Rostov-Stalingrad belt a route toward Moscow lies along the broad lowland east of the Don. An approach to Moscow from Leningrad lies over a series of hills and wet lowlands; the most formidable of these wet lowlands is the Ozero Il'men'-Volkhov valley basin south-southeast of Leningrad.

3. OCEANOGRAPHY

The ocean coasts of European USSR consist of three widely separated sectors. The north coastal sector borders on the southern Barents Sea, and includes the White Sea (Beloye More) and a portion of the Kara Sea (Karskoye More). The west coastal sector is the Baltic Sea coast, including the Gulf of Riga and the south coast of the Gulf of Finland. The south coastal sector borders on the northwestern Black Sea, and includes most of the Sea of Azov (Azovskoye More).

A. Tides

The north coastal sector has semidiurnal tides with small diurnal inequality. Tidal range is affected by topography and varies greatly from place to place. The west and south coastal sectors have negligible lunar tide, but undergo periodic fluctuation in water level under the influence of wind, atmospheric pressure, river discharge, and the annual thermal cycle.

B. Circulation

The current regime off the north coastal sector is dominated by a relatively warm current recognizable as an extension of the Gulf Stream. A complicated pattern of tidal currents and wind-driven currents also exists. Wind-originated local currents are also found in the numerous channels and sounds of the west coastal sector, with a slow circulation out of the Baltic Sea representing the excess of precipitation and river inflow over evaporation. A fairly steady current system exists off the south coastal sector, subject to seasonal variations and the influence of prevailing winds.

C. Sea and swell

Sea conditions in summer are good in all three coastal sectors. They are generally poor in winter, although in the presence of ice the wind fetch is reduced, resulting in lower wave heights. Currents also temporarily affect wave height and steepness, depending upon the degree to which current direction and wind direction are opposed. Information on swell conditions is inadequate, but it is unlikely that severe swell occurs independently of high seas, particularly in the protected waters of the west and south coastal areas.

D. Ice

Ice forms in winter off all the coasts of European USSR except the Murman Coast (Murmanskiy Bereg) in the north coastal sector. The White Sea has a short navigation season less than that of our Great Lakes, and sea ice forms over all the area east of its entrance. In the west coastal sector the Gulf of Finland is closed to navigation for about three months, but most ports farther south on the Baltic Sea can either be entered all winter by ordinary vessels or be kept open by ice breakers. In the south coastal sector, Sevastopol' normally is ice-free, and most other ports south of latitude 45°3'N are open all winter, with ice breaker assistance in some cases. Icebergs do not occur in any waters of European USSR.

E. Temperature

The coastal waters of European USSR are fairly cool, with summer maximum surface water temperatures of about 60°F. in the White Sea and 50°F. in the open Barents Sea; 70°F. at the head of the Gulf of Finland and 60°F. in most of the rest of the Baltic Sea; and 75°F. in the south coastal sector.

F. Salinity

The surface salinity of the open Barents Sea is that of the normal Atlantic Ocean, 34 to 35 parts per thousand. It drops to about 20 parts per thousand in the northern part of the White Sea, and still lower toward the heads of the gulfs and off the mouth of the Pechora. In the Gulf of Finland, it increases from 2 or less at the head to 6 at the mouth, and in the Baltic Sea it ranges between 6 and 8 parts per thousand. Surface salinity in the open Black Sea is 17 to 18 parts per thousand, decreasing off river mouths. Dead water in a mild form is encountered along the Murman Coast and may also occur in the Black Sea.

G. Conductivity

Electrical conductivity of the surface waters ranges from a minimum of 0.002 reciprocal ohm per centimeter cube near river mouths to a summer offshore maximum of

0.035 in the north coastal sector, 0.015 in the west coastal sector, and 0.025 in the south coastal sector.

H. Color and transparency

In the north coastal sector the color of the offshore Gulf Stream water is intense blue, and the coastal waters are greenish. The waters of the west coastal sector are of various shades of green, yellow-green, and greenish brown. The Black Sea is probably greenish near shore and blue offshore. In all sectors the waters are less transparent near the coast than offshore, and are least transparent in spring and early summer.

I. Bottom sediments

Bottom sediments off the north coastal sector vary with locality. Mud, stone, or sand make up much of the floor of the Barents Sea; inshore, rock or stone is found west of Novaya Zemlya and is common off the headlands, around the small islands, and in the straits; patches of mud characterize the deeper portions of the White Sea and the inlets. There are also areas, many of considerable extent, of sand, sand and mud, or clay.

Sediments along the west coastal sector are patchy; near shore they consist of mud, sand, sand and mud, clay, stone, or rock, while in the deeper waters of the central portions of the Black Sea, and also in the adjoining gulfs, mud, sand and mud, sand, or sandy clay will usually be found.

Off the south coastal sector mud, or sand and mud predominate, with nearshore sediments mostly sandy. There are patches of rock or stone off most of the numerous headlands.

J. Other marine elements

Phosphorescent organisms such as *Noctiluca* probably occur in all coastal waters of European USSR. Although there are no records of them from the Baltic, they are abundant in the Black Sea. No large seaweeds are to be found, although small forms and eelgrass will be encountered on rocks everywhere. Floating tree trunks carried down in the spring freshets will be encountered in and off the White Sea.

Hydrogen sulfide, a highly toxic gas, is found dissolved in the water of the Black Sea below about 400 feet, the content increasing with depth.

K. Observations on vessel operation

In the north coastal sector, well-developed temperature and salinity gradients in summer in the White Sea result in short periscope depth and assured ranges. During late spring and early fall there is a limited period of isothermal water with long ranges at all depths. Temperature inversions (increase of temperature with depth) in the same months result in long periscope-depth ranges and short assured ranges. In the Barents Sea off the Pechora short periscope-depth and assured ranges will also prevail during the summer. Offshore the mean depth of isothermal water is 100 feet, resulting in long periscope-depth ranges (2,000 yards or more); the well-developed negative temperature gradients below this isothermal layer result in short assured ranges (1,200 to 1,400 yards).

In the eastern part of the Gulf of Finland during spring and summer, periscope-depth and assured ranges will be short, increasing in the central portion of the Gulf to 2,000 yards or more for periscope-depth and 1,200 to 1,400 yards for assured range. Long periscope-depth ranges and short assured ranges, resulting from temperature inversions, will be encountered in the Gulf of Finland in early spring and late fall. In the Baltic Sea in the summer, the depth of the isothermal layer will be 100 to 150 feet, resulting in long periscope-depth ranges and assured ranges of 1,400 to 1,600 yards. During limited periods in late spring and early fall, the isothermal layer will increase to over 400 feet in depth, giving rise to long ranges at all depths.

In the south coastal sector, offshore in the Black Sea the periscope-depth range during summer will usually be long, 2,000 yards or more, and the assured range 1,200 to 1,600 yards. In the northwest portion, influenced by discharge from the Danube and other rivers, extreme temperature and salinity gradients exist in spring and summer, resulting in short periscope-depth and assured ranges; in the fall, although isothermal conditions exist, salinity gradients will still lead to short sonar ranges.

Snapping shrimp have not been reported from any of the coastal waters of European USSR, and few of the other noise-making organisms are known to be present. Fish feeding on mollusks or crustaceans will probably be heard however, in all coastal waters; likewise, seals and porpoises in the north and south coastal sectors, and whales in the Barents Sea may give rise to spurious echoes.

Positive ballast increments of 10,000 to 20,000 pounds when diving from periscope depth to 400 feet will be necessary to maintain trim at depth in spring and summer in the White Sea, in the Barents Sea off the Pechora, and in the northwestern portion of the Black Sea. Similar increments of 10,000 pounds or more will be necessary inshore in the Gulf of Finland from late spring to early fall. In the Baltic and the central waters of the Gulf of Finland ballast increments will be positive in the summer but may be positive, isoballast, or negative in spring and fall. Offshore in the Barents Sea ballast increments will usually be positive, but may be negative during periods of isothermal water or temperature inversion. Offshore in the Black Sea ballast increments will usually be positive in the summer, but will be isoballast or negative in spring and fall. In the northwestern portion of the Black Sea in early spring and late fall, although isoballast conditions will be indicated by BT card, vertical salinity gradients will usually necessitate flooding to attain trim.

4. COASTS AND LANDING BEACHES

The coasts and landing beaches of European USSR are divided into three widely separated sectors corresponding to geographic locations: the *North Coastal Sector,* facing the arctic and bordering the Barents and White Seas; the *West Coastal Sector,* facing the Baltic and including the Gulf of Finland and the Gulf of Riga; and the *South Coastal Sector,* bordering the Black Sea and The Sea of Azov (Azovskoye More) (FIGURE I-9).

Sector 41. *North Coastal Sector* (Karskaya Guba to the Norwegian Boundary).

Low, mildly undulating marshy tundra with frozen subsoil, or high barren granite hills along the Arctic coast; and undulating, forested, often marshy coast along the White Sea. Extensive sandy beaches in both areas fronted by shallow nearshore depths and often by rocks or drying flats. Ice obstructs navigation or landing most of the year, except along the Murman coast. Communication lines are scarce and beach exits generally poor.

Sector 42. *West Coastal Sector* (Mys Kryuserort (Ristniemi) to Stutowa (Stutthoff)).

North shore of Gulf of Finland high and wooded, north coast of Estonian SSR cliffy; remainder of area flat coast-

al plain. Short beaches of sand, pebble, rock, or mud as far as Gulf of Riga, where almost continuous sandy beach begins, often backed by dune barriers. Approaches obstructed by islets, rocky shoals, reef patches or shallow flats, except along Baltic where coast is generally clear. Coast borders the approaches to Leningrad, Vyborg, and principal ports of Estonian, Latvian, and Lithuanian SSR's. Roads and trails inland generally numerous although direct exits often hindered by steep cliffs, marshy bayhead areas, or sand dunes.

Sector 43. *South Coastal Sector* (Danube river mouth to Port-Katon)

Wide variety of terrain, with river deltas and estuaries; prevailingly low and marshy and fronted by shallows. Generally extensive sand beaches, frequently along narrow spits. South coast of Crimea has short sand or cobble pocket beaches between breaks in cliffy mountainous coast, with approaches clear, and exits to resort towns and improved mountain roads.

A. North coastal sector

(Sector 41, FIGURE I-9)

From the Ural foothills at Karskaya Guba to Pechorskaya Guba (Pechora Bay), the region known as the Bol'shezemel'skaya Tundra, the coasts are low and backed by level tundra except to eastward, where the foothills approach the coast, creating occasional rugged, rocky terrain. Vegetation is limited to moss, grass, bushes, and stunted trees covered with lichens, and the subsoil is permanently frozen 2 feet below the surface. Coniferous forests extend inland beginning at distances from the coast varying from 50 miles to 100 miles. The off-lying islands, Ostrov Vaygach and Novaya Zemlya, become progressively mountainous to northward. The northern two-thirds of Novaya Zemlya is covered with ice and glaciers which present a fairly level surface inland. Around the southern tip of Novaya Zemlya and on Ostrov Vaygach the coast is low and gently sloping, but the shores are generally steep and rocky.

From Pechorskaya Guba to the entrance to the White Sea, the area known as the Malozemel'skaya Tundra, is a low, mildly undulating plain, broken at the center by the Timanskiy Kryazh, which is generally less than 650 feet in elevation. The coasts are low, with occasional sand hills behind the beaches and low scattered hills inland. Where the Timanskiy Kryazh and its apparent extension, the Kryazh Kanin Kamen', approach the coast, the shores are rugged and rocky. The hilly island, Ostrov Kolguyev, is low and level along the shores of the southeastern half.

Steep shores and the Zimniye (Winter) Gory, lie along the eastern coast of the White Sea. A moderately high headland separates Dvinskaya Guba and Onezhskaya Guba on the southern coast, but the terrain is low and undulating along the rivers at the heads of these bays. The rugged, rocky western coast is backed by low wooded marshy terrain, with many lakes. Hills 2,000 feet in height rise at the head of Kandalakshskaya Guba, on the northwestern coast. The northern coast of the White Sea is wooded and rises to rocky hills which fringe the coast to eastward, creating an almost continuous cliff along the western shores of the entrance to the White Sea.

Along the entire Murman Coast (Murmanskiy Bereg) of Kola Peninsula (Poluostrov Kol'skiy) bold, rounded granite hills front the coast, which is irregular and indented by many bays and inlets. Inland the terrain consists of high, undulating tundra with many lakes. This is the only north coastal subsector which remains generally ice-free throughout the year.

Extensive sandy beaches predominate from the eastern sector limit at Karskaya Guba to the White Sea and along the shores of the White Sea; they are generally fronted by very shallow depths, sandy shoals, and drying flats. Beaches along the Arctic shore are backed by tundra terrain, while those bordering the White Sea are backed more generally by sand and clay bluffs or by sand dunes. The relatively few known beaches on the off-lying islands are restricted to the heads of bays and along river mouths, fronted by flat bottom slopes or nearshore rocks, and backed by steep slopes, tundra, or tongues of glaciers. West of the White Sea, the few known beaches are short, scattered areas, averaging generally one mile or less in length, located at the heads of shallow bays and generally obstructed by rocks. Many of them front small isolated summer fishing settlements or villages with few accessible trails. In general, beach exits to roads are very limited. The many large rivers in this area are navigable for many miles inland and serve as primary communication routes. In every case, however, the river mouths are filled with shifting sandbanks and are usually unnavigable by other than small boats. Channels have been dredged through the mouths of several rivers flowing into the White Sea; elsewhere high water must be awaited to assist passage. Roads in the sector are limited to winter and unimproved roads except along the southern and western shores of the White Sea where there are also railroads. Murmansk, 26 miles inside Kol'skiy Zaliv (Kola Inlet), is served by rail; good roads in the vicinity are of only local extent. A spur of the Pechora railroad, which otherwise lies far southward of the coast, is reported as under construction to Amderma, on the Kara Sea. Soil trafficability is considered generally poor throughout the coastal area. Summer weather reduces the sandy humus tundra to shallow marshes, but good drainage and the frozen subsoil add somewhat to trafficability. Reindeer sleds are the native mode of transportation throughout the year. The terrain around the White Sea is fair for trafficability and bears the normal obstacles of forests, marshy localities, hills, and rocky areas.

B. West coastal sector

(Sector 42, FIGURE I-9)

From Mys Kryuserort (Ristniemi) to Leningrad the northern shore of the Gulf of Finland is high and wooded, rising gradually to 300 feet at Koyvisto. Shoal patches are scattered throughout Vyborgskiy Zaliv (Gulf of Viipuri), which extends 19 miles northeastward from Mys Kryuserort to Vyborg (Viipuri), a port with excellent harbor facilities and served by both rail and road connections inland. The primary port of Leningrad is approached by a channel with a minimum depth of 31 feet, and has rail connections with all parts of Europe. The city is exposed to floods in the spring and fall as a result of backwash from the gulf during periods of heavy wind. A broad coastal plain reaches from Leningrad to Luzhskaya Guba (Luposkaya Guba), with marshes, flat sandy beaches and meadows along the coast, intersected by short, shallow rivers and dune stretches covered with rock detritus. Precipitous cliffs edge the eastern shore of Luzhskaya Guba. The shores of Narva Laht (bay) are generally low, sandy and wooded, with approaches generally obstructed by numerous islets and rocky shoals. From Ledipaa Nina, the eastern entrance point of Kunda Laht, to Põõsaspää Neem (Pôôsaspea), the northwestern point of Estonian SSR, the coast is based upon a rocky limestone platform with many peaked, precipitous cliffs, showing level stratification, and intersected by deeply cut river valleys. The shoreline is indented by numerous bays with sandy beaches and wooded shores. Exits inland are available at breaks in the steep coast, but connection with the interior is available

only at the ports of Tallinn and Paldiski. Movement in the natural countryside is hampered by large land tracts and the absence of good roads.

The ragged western coast of Estonian SSR from Rooslepa to Kiriku Nina (point) is low, rocky, and fronted by offlying shoals. The islands Hiiumaa (Dago), Saaremaa (Ösel), Muhu (Moon), and Vormsi, which lie to the westward across the entrance to the Gulf of Riga, are flat to slightly rolling. They are formed of limestone platforms covered with a considerable thickness of sand and coarser rock detritus. The sounds between the islands are generally shallow, fouled by sandbanks, and not suitable for navigation. The coastal stretch along the Gulf of Riga from Kiriku Nina to Kolkasrags is low and flat, broken only by river courses draining into the sea. The shore is generally of firm sand except for swampy areas around the Kasari and Pärnu river mouths, where there are extensive bog areas, flooded meadows and forests, which impede movement inland. Shallow flats skirt the coast, extending 1.5 to 3.5 miles off-shore. Pärnu, at the head of Pärnu Laht, and Rīga, approximately 7 miles inland from the mouth of the river Daugava (Zapadnaya Dvina), are the principal commercial ports on the gulf. From Ko'kasrags, the northernmost point of Latvian SSR, to Oviši, the coast is generally low and bare, with a few scattered hills.

From Oviši southward to Liepāja, the Baltic coast of Latvian SSR is flat and sandy, backed by dunes and partially wooded sand hills. From Liepāja (Libau) the coast trends southward to Klaipėda (Memel), in Lithuanian SSR; the shoreline alternating between low sand hills and forest groves. Cultivated areas lie between the low sand hills close to the coast and the fir forests, which begin about 1 mile inland. A dune barrier separates the coastal plain from the sea along this Baltic coast, behind which numerous small coastal rivers form swamps and ponds, which greatly hinder movement inland. Most of the harbors are oriented diagonally to the sea. The railroad is laid out upon the dune wall. The roadstead for Liepāja, an important commercial city at the outlet of the lake Liepājas Ezers, is entirely unprotected and not favorable for anchorage.

From Klaipėda the coast trends southwestward for 50 miles along the Kurische Nehrung, a narrow sandy peninsula which separates the Baltic from Kurisches Haff, a large inland body of water whose northern entrance forms Klaipėda harbor. The eastern shore of the Haff is low and marshy in the north at the delta of the river Nemunas; from there southward, it is low and thickly wooded. The northern part of the Haff has depths from 3 to 6 feet, and the southern and wider portion, 2 to 3 fathoms. Kurische Nehrung joins the Zamland peninsula near Krants, where the coast rises steeply to a height of 365 feet at Gallgarben. The center of the peninsula is covered with well-cultivated fields and the shores are high and wooded. The coast then follows another sandy peninsula, the Frische Nehrung, which is the ocean barrier for Frisches Haff, whose entrance channel, at the northern end, runs through the harbor of Baltiysk (Pillau). A ship canal runs from Baltiysk through the northern section of the Haff to Kaliningrad (Königsberg), a primary port on the river Pregel'. General depths in the Haff are 1.2 to 2.5 fathoms over soft clay and sand bottom. Frische Nehrung is a long, wooded dune peninsula extending from Baltiysk to Sztutowo (Stutthof), the sector limit.

Short, generally obstructed beaches border the shores of the Gulf of Finland and the island and mainland shores just north of the Gulf of Riga along the west coast. South and southwestward along the Gulf of Riga and the Baltic Sea, sand beaches are almost continuous. Roads and railroads are generally available along this coast, although direct exits from the beaches are often hindered by steep cliffs, marshy bayhead areas, or sand dunes.

C. South coastal sector

(Sector 43, FIGURE I-9)

The Danube delta is low, sandy, devoid of trees, and fronted by a shallow flat. From the Danube delta to the mouth of the Dniester, the coast skirts a low-lying plain which is just above sea level in places, with occasional small hills. From the Dniester mouth northward to the bay Odesskiy Zaliv the coast becomes steep, with precipitous clay cliffs intersected by ravines. Odessa, one of the principal trading ports of the Black Sea, is situated at the southern extremity of the bay, with a breakwater-protected harbor. The city is connected to the general railway system which serves the principal European cities, and first-class roads connect it with inland cities of the USSR. From Odesskiy Zaliv to the mouth of the Dnepr, the coast is moderately high, steep, and reddish in color. Eastward from the Bug estuary the shore has an almost even elevation of from 145 to 160 feet, consisting of clay bluffs broken by gullies and valleys. The secondary port of Nikolayev is situated on the eastern bank of the river Bug about 21 miles above the entrance. At the head of its estuary the Dnepr flows into the Black Sea through many interlacing channels, forming a large marshy delta bordered by extensive shallow flats. Kherson, a primary port, is situated on the northern bank of Koshevaya branch, at its junction with the Dnepr. The southern shore to the Dnepr estuary, Kinburn peninsula, which divides the Dnepr estuary from Yegorlytskiy Zaliv (Yagorlilski Bay), on the south, is low and sandy with scattered hills, small groves of trees, and bushes. South of the shallow Yegorlytskiy Zaliv a low, sandy peninsula, Tendrovskaya Kosa extends southeastward for 34 miles to the mainland. From this junction point the remainder of the northern shore of Zaliv Karkinitskiy (Gulf of Karkinitt) is moderately high, and indented in the eastern part by numerous small bays and by extensive shallow flats which occupy the entire eastern end of the gulf.

The southern shore of Zaliv Karkinitskiy from the point Mys Kartkazak to Bakal'skaya Kosa (spit), 24 miles southwestward, is low and flat; bordered by extensive shoals. Westward of the spit the coast is steep, gradually rising in height to Mys Kara-Burnu, the northeastern entrance point to the bay, Bukhta Yarylgachskaya; thence continuing low, rocky, and cliffy to the cape, Mys Tarkhankut, where the coast turns eastward. From Mys Tarkhankut, the western extremity of the Crimea, the coast is high and steep for 12 miles, and from there to Ozero Bogayly (Kichik-Byel lake) is low and sandy. Southward of the lake the coast is steep, and the reddish-clay cliffs are intersected in places by river valleys. Sevastopol' harbor, entered between the points Mys Konstantinovskiy and Mys Aleksandrovskiy, is well sheltered from southward and is one of the safest ports on the Black Sea. The harbor never freezes and is accessible to vessels of the deepest draught. Southwestward to Mys Khersonesskiy the coast is high and rocky, deeply indented by several bays, with moderately steep and barren shores.

The mountainous southern coast of the Crimea, from Mys Khersonesskiy for about 135 miles east-northeastward to Kerch Strait (Kerchenskiy Proliv), consists generally of gently descending mountain slopes or terraces, which in the south drop in abrupt precipices to the sea. Between these are many bays with smaller indentations, intersected

by brook basins which dry in summer. Approaches from seaward are unobstructed and general depths of 5 fathoms lie close to the shore. A primary road skirts the coast from Sevastopol' to Feodosiya with roads leading over the mountains from coastal towns to the main highway farther inland. Yalta, a generally ice free port on the southern coast, has a well-sheltered harbor with a least depth of 17 feet. Feodosiyskiy Zaliv (Feodosiya Bay), between Mys Il'i and Mys Chauda, affords good anchorage in depths from 5 to 12 fathoms over soft mud bottom. Eastward from the bay to Mys Takil' the coast is considerably lower and characterized by hills rising in height to 630 feet at Opuk.

Kerch Strait, which connects the Sea of Azov with the Black Sea, varies in width from 2.5 to 8 miles, and is encumbered by extensive shallow banks and shoals. The coast along the western side of the strait consists of high uplands, rising in places to hills which terminate in bluffs and cliffs along the shore. In the low-lying areas between the hills, are marshes and lakes. The northern coast of Kerchenskiy Poluostrov (Kerch Peninsula), from Mys Khroni to the southeastern end of Arabatskaya Strelkt, is high and backed by hills. Arabatskaya Strelka is a low, sandy spit about 60 miles long and between 0.3 and 4.5 miles wide. The eastern side of the spit is fringed by a shallow flat with depths of 20 feet one mile offshore. Kosa Fedotova, which forms the eastern shore of Utlyukskiy Liman (Utlyuk Estuary), is likewise low and sandy. Good anchorage is available anywhere in the southern part of the estuary in depths of 19 feet, but the northern part is shallow. The northern shore of the Sea of Azov trends east-northeastward from Kosa Fedotova to the head of Taganrogskiy Zaliv (Gulf of Taganrog). The coast consists mainly of cliffs of even elevation fringing barren plains or steppes. Several sandspits, bordered by extensive flats, project in a south-southwesterly direction from the general line of the coast. Obitochnyy, Byerdyanskiy, and Byelosaria bays are entered westward of the spits and afford good shelter from easterly winds. Within the northern side of Taganrogskiy Zaliv, which extends from Belosarayskaya Kosa (Byelosaraika Spit) to the Don delta, a level, and in places salty, steppe terminates at the coast in steep clay cliffs. Although precipitous in places, the cliffs are generally broken up into terraces by landslips, and intersected by deep ravines cut by streams. The shore consists of a narrow beach of sand and shells. Several low sandy spits, fringed by shallow flats, extend southward from the general line of the coast. Mariupol', on the western bank of the river Kal'mius, and Taganrog, near the head of the gulf, are important ports on the northern coast. The low marshy delta of the Don comprises the eastern shore of the gulf and is fringed by a very shallow flat and numerous islands, almost awash. Of approximately 24 deltoidal branches through which the Don empties into the gulf, the route through the Peschanoye mouth, thence through the Staryy Don, is used as the approach to the port of Rostov-na-Donu, which is situated about 27 miles eastward from the Peschanoye mouth. The southern shore of the gulf consists of terraced clay cliffs of even elevation, intersected by ravines. The spits which extend from this side are more extensively fringed by flats than those to the northward.

Beaches are long and sandy throughout most of this sector, many of them bordering narrow spits or barriers. Fronted by flat-bottom slopes, approaches are otherwise generally clear nearshore. Exits are usually limited because of sand dunes, salt lagoons, or low cliffs; or by the general absence of good roads. In the southern Crimea beaches are short, often isolated by steep slopes or rocky headlands, and fronted by rocky nearshore areas. There is usually direct access to the coastal road.

5. CLIMATE AND WEATHER

A. General characteristics

The climate of European USSR is strongly continental, with long, cold winters and short, moderate summers. The area extends from 45° to 70° N., corresponding to the portion of North America from the Great Lakes to the north coast of Canada, so that there is considerable diversity of climatic characteristics. Climatic differences are caused primarily by latitudinal difference and by degree of proximity to the waters of the Baltic Sea and the Gulf of Finland. In general, the climate of European USSR is not so severe as in the comparable latitudinal zone of North America or Siberia. The severity of the climate of western USSR is lessened considerably by the eastward movement of air modified by the warm ocean currents of the North Atlantic.

The topography of European USSR is almost entirely unbroken by relief that would cause marked variations in weather. Only in the region of Kola and Murmansk, in the western Ukraine, and along the eastern border of the area are there any extensive mountain areas. Even these are low and well eroded and offer only a partial block to the movement of air. Because of the lack of topographic variations, no well-defined borderlines between zones of homogeneous climatic conditions are evident (FIGURES I-4 and I-5).

Along the north coastline the ground, and in most cases the sea, is frozen during the winter which lasts from September to May (FIGURES I-4 and I-5). The three months of summer weather consisting of cool, foggy, rainy days, thaws only the surface of the ground, leaving it in a marshy condition. Mean temperatures along this coast are approximately 10° F. in winter and reach the high fifties in summer (FIGURES I-4 and I-5). Precipitation is usually in the form of snow in winter and rain in summer. Maximum precipitation occurs in summer with a monthly average of about two inches.

Along the Baltic Sea and the Gulf of Finland, winter temperatures vary not with latitude, but with distance from the water as the chief source of warmth in the area during the winter season. On the coast the mean temperatures range between approximately 25° F. in winter and the middle sixties in summer.

Over the central and eastern portions of European USSR, the continental influence of the large Asiatic land mass is evident in the dry, cold winters with mean temperatures approximately 10° F. and the warm summers with moderate rainfall and mean temperatures in the fifties and sixties.

The southwestern zone of European USSR—the Ukraine—is similar in climate and topography to the northern Great Plains of the United States and the province of Saskatchewan in Canada. The winters are long, dry, and cold, and the summers are hot and short. The mean winter temperatures in the Ukraine decrease rapidly toward the north since the Black Sea has an ameliorating effect only on the coastal climate. The summers are cooler along the Black Sea coast.

The southeastern zone of European USSR—the Volga Basin and the Caspian Sea coast—is considerably drier than the Ukraine. Astrakhan', near the Caspian Sea, has

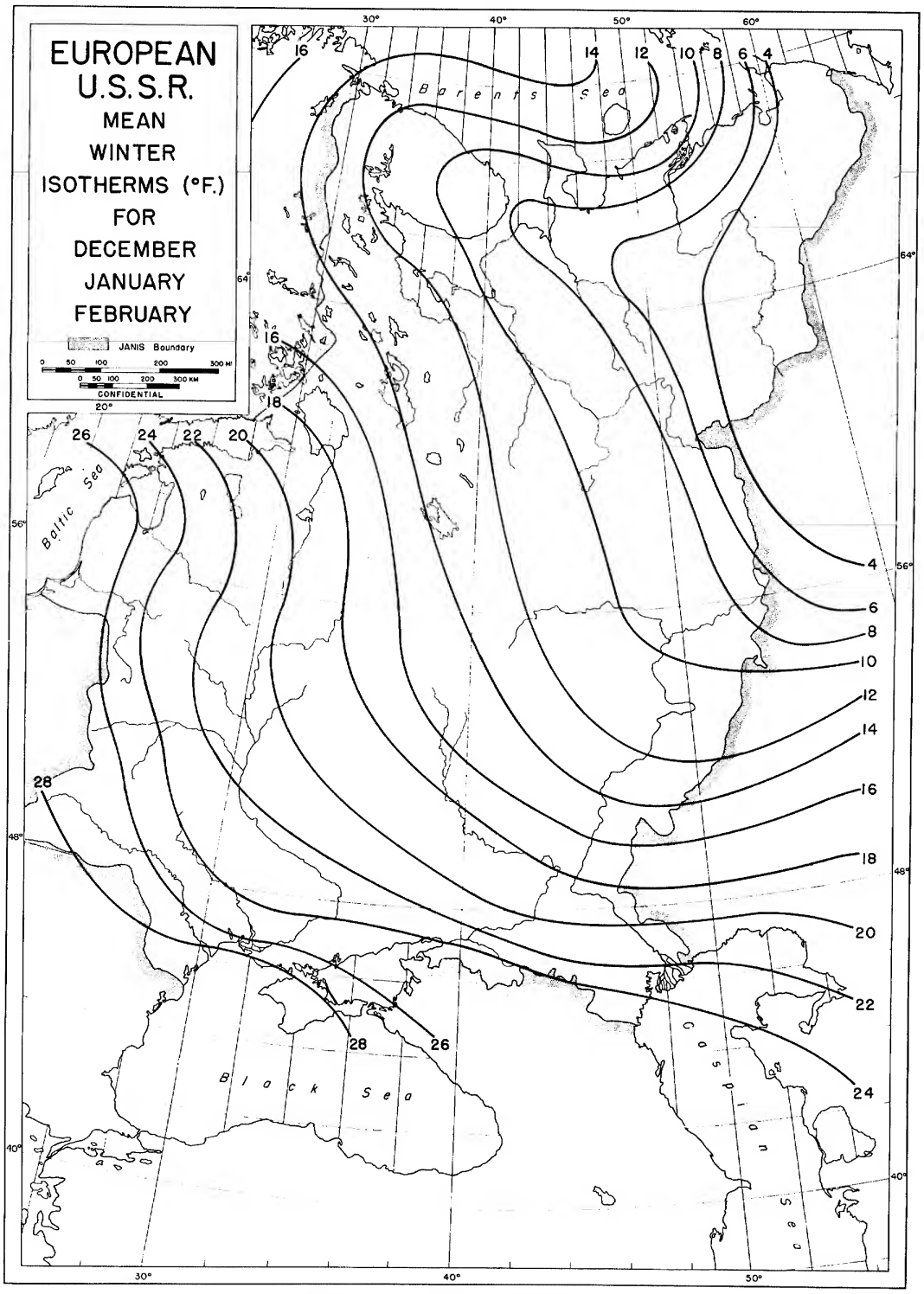


FIGURE I-4. *Mean winter isotherms (F.)*

an arid climate with a mean annual rainfall of approximately seven inches. The rainfall increases toward the north where the Caucasus Mountains do not block the moist air from the southwest. The temperature variations in the dry air of this region are greater than those along the Black Sea coast at comparable latitudes.

Tabulated data on mean conditions are only an indication of the general trend of conditions; they do not give an adequate description of extreme conditions. Throughout the year, there is considerable day-to-day variation in weather conditions comparable to the changes which may be expected in North America or western Europe.

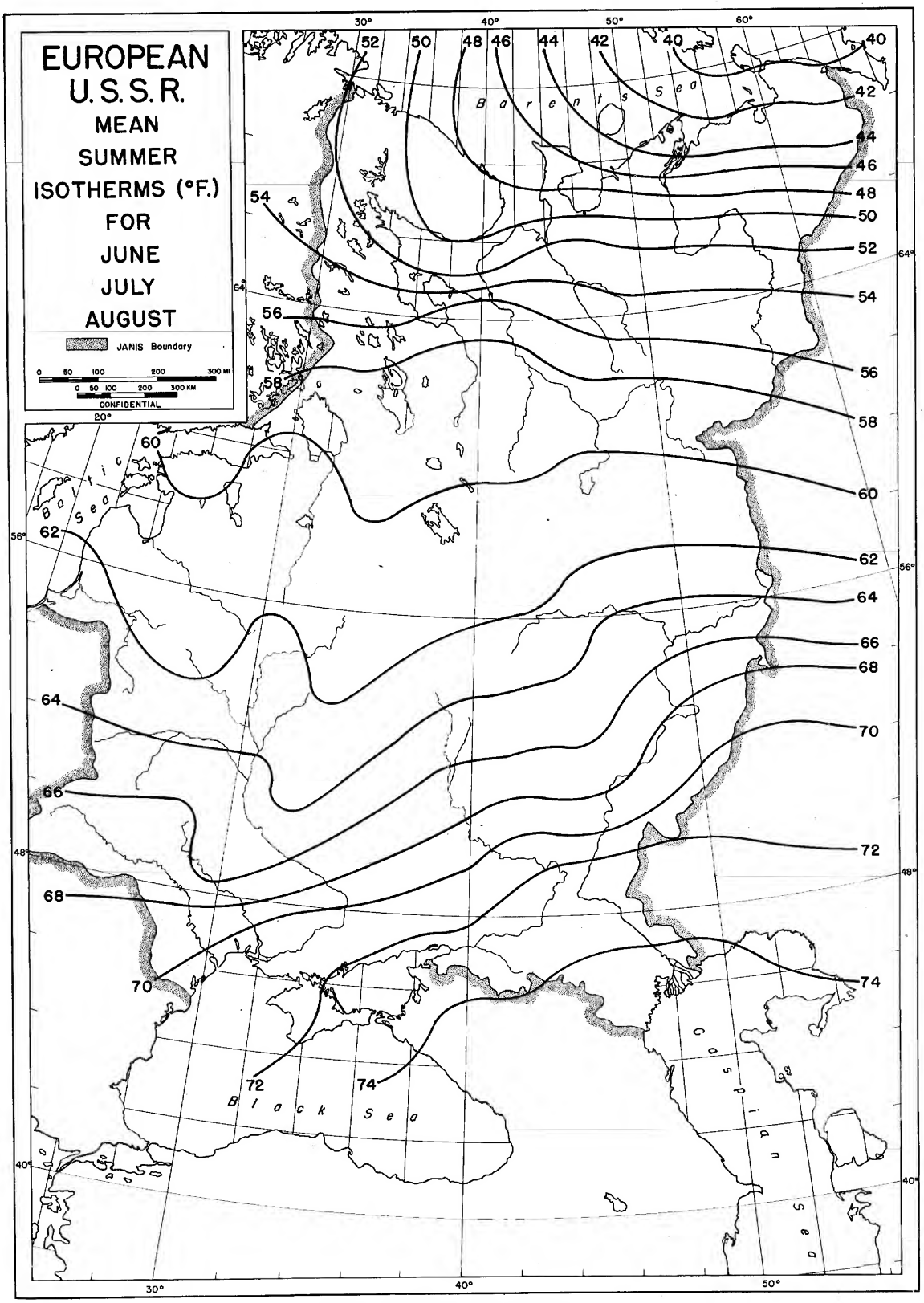


FIGURE I-5. *Mean summer isotherms (F.)*

B. Elements of weather and climate

(1) Precipitation

European USSR is a region of low precipitation compared with the United States or western Europe. Its precipitation regime is transitional from the moist maritime regime of western Europe to the arid regime of central Asia. Mean annual rainfall exceeds 25 inches in few localities. Greatest annual rainfall occurs in the west, along the Baltic coast and in the Ukraine. Least rainfall occurs in the east and on the islands off the Arctic coast. Except near the Black and Caspian Seas, maximum rainfall occurs in summer as convective showers, and minimum precipitation occurs in winter in cyclonic storms. On the southern sea coasts, maximum precipitation occurs in the winter associated with cyclonic storms from the eastern Mediterranean and Black Seas.

Winter precipitation falls as snow except in the extreme south. Snow cover over most of European USSR lasts from October or November to April or May.

Droughts occur frequently enough to be a constant threat to agriculture.

(2) Temperature

Severe, long winters and short, moderately warm summers with extremely brief transitional periods are the rule in all but the southern part of this area. Mean daily maximum temperatures are below freezing at most stations throughout the winter. The difference in mean daily maximum temperature in European USSR is from the low forties in the south to almost zero in the northwest. Mean daily minima range from the middle thirties along the Black Sea coast to a few degrees below zero in the northeast. In the summer the mean temperature range is from the middle fifties to the middle eighties.

(3) Winds

Prevailing winds during the winter are southerlies at the surface and westerlies aloft, although the distribution of wind is fairly uniform around the compass. In summer, northerlies prevail. Gales and calms are frequent, and the changes in wind direction and velocity are great. Highest wind velocities occur in winter, and the lowest in summer, although the range is small.

(4) Visibility

Restrictions in visibility are caused primarily by fog, dust, precipitation, and blowing snow. There is a maximum of low visibilities in the morning coincident with a maximum of radiation fogs. In general, low visibilities are most frequent in winter when they are caused by blowing snow and fog, and least frequent in summer (FIGURE I-6). The Arctic coast is an exception; warm air from the continent is cooled by the cold waters, causing a high frequency of advection fog and resulting poor visibility in the summer.

(5) Cloudiness and ceilings

Cloudy weather and low ceilings occur most frequently during winter. This coincides with a maximum of stratus clouds which occur when outgoing radiation is greatest. Throughout the year there is a maximum of low ceilings and cloud cover in the early morning. Minimum frequency of cloudy days and low ceilings occurs in the summer at most stations. Exceptions are stations along the Arctic coast where stratus clouds are frequent in summer. Frequency of low clouds and cloudy days varies greatly from station to station because small topographic features have considerable influence on the formation of low clouds.

C. Weather as related to military operations

(1) Ground operations

Conditions for mobility of equipment and personnel are best during the winter when the ground is thoroughly frozen, and in the fall and late summer when the soil is completely thawed and drained. During the spring and early summer, melting snow and ice cause extremely muddy conditions which restrict operations to a minimum. Winter temperatures are extremely low and much discomfort is experienced by personnel working outdoors. Equipment must be specially protected against cold. Along the Arctic coast summer weather thaws only the surface soil, leaving the subsoil frozen. The resulting marshy conditions greatly restrict ground operations in summer.

(2) Air operations

Flying hazards are much the same as those encountered in the northern United States and Canada. The frequency of weather conditions favorable for contact flying is shown on FIGURE I-5. The large storms moving across European USSR are usually not so severe as those over the United States and Canada. Hazards are fog, low clouds, gusty surface winds, and reduced visibility in winter. Icing is common, but the most dangerous types of icing are not frequent in the north where temperatures are very low. In summer, cumulus clouds and thunderstorms are fairly common. Summer fogs are frequent in northern coastal areas. Maintaining airstrips during thaw in the spring is difficult. In winter, snow-removal equipment is necessary at all air bases unless aircraft are equipped with special landing gear.

(3) Naval and amphibious operations

The three coastal sectors of European USSR—north, west, and south—have quite different climatic conditions but in each, winter is the most hazardous season for naval and amphibious operations.

In the north coastal sector—Barents, Kara, and White Seas area—conditions are especially difficult from October to May. Ice begins to close the Kara and White Seas by early October and, although ice breakers keep certain sections open until December, normal navigation is not possible until late April or May (FIGURES I-7 and I-8). During the winter 1943-44, the Bakaritsa Terminal of Arkhangel'sk was kept open by ice breakers, and it is reported possible for ice breakers to keep Arkhangel'sk open. Even in the most favorable months of August and September, ice is a danger in the Kara Sea. The western portion of the Barents Sea is not icebound, and Murmansk is an all-year port. Winter operations are further hampered by gales, rough seas, blowing snow, and freezing rain or sea spray.

During the more favorable period—May to October—fog is a hazard to navigation, and onshore winds often cause waves high enough to hamper amphibious operations.

The west or Baltic coast, although frozen for a shorter period than the north coast, becomes even more completely icebound. The ports of Leningrad and Vyborg are closed to navigation for more than 100 days of the year. Gales occur on 3 or 4 days a month from November through January and seas are moderate to rough on an average of 8 days a month until the sea becomes frozen in December. Sea fogs may be a hindrance from May to July but, generally, conditions are favorable during the summer season, light seas prevailing more than 50% of the time.

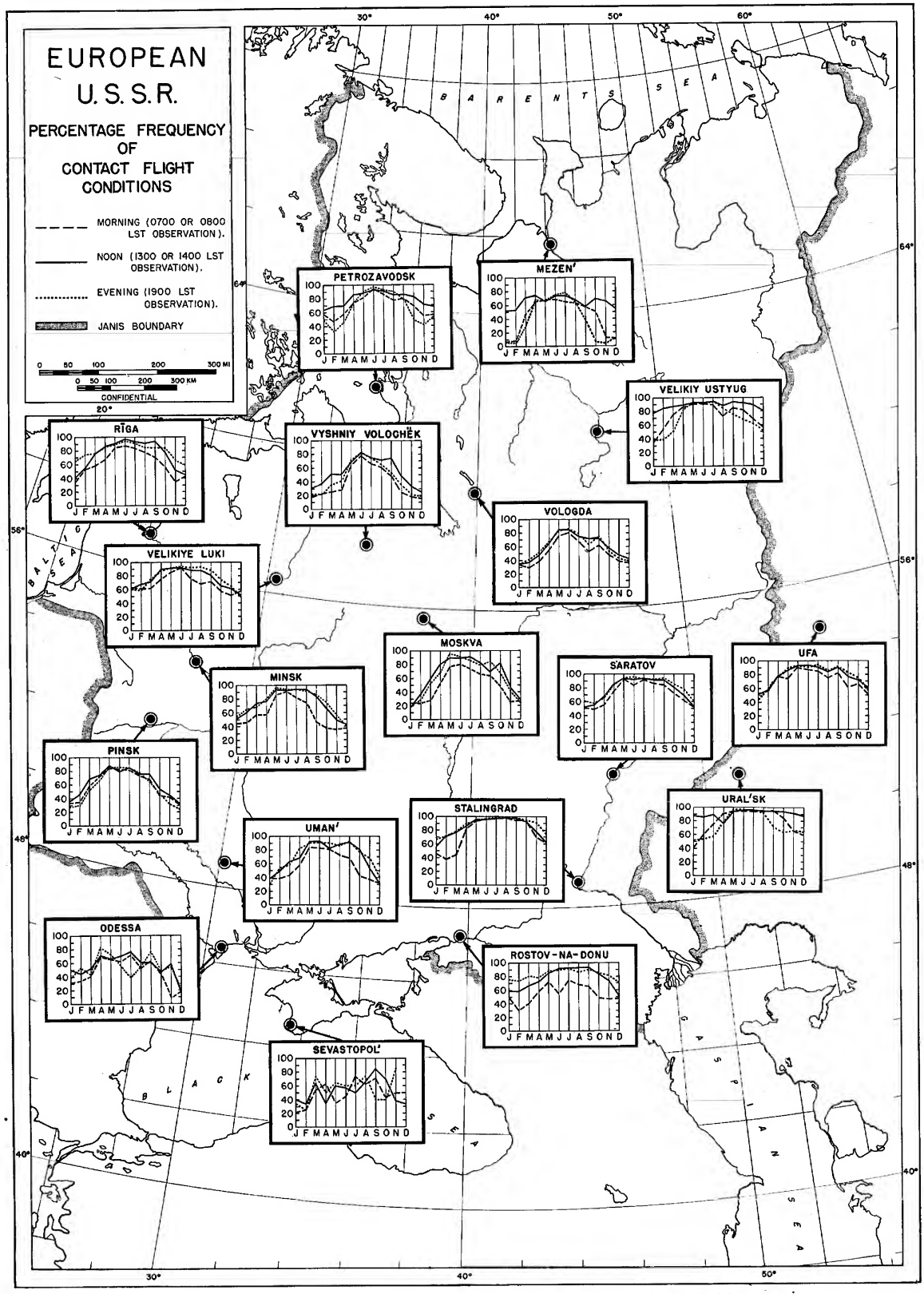


FIGURE I-6. *Percentage frequency of contact flight conditions at specified hours*

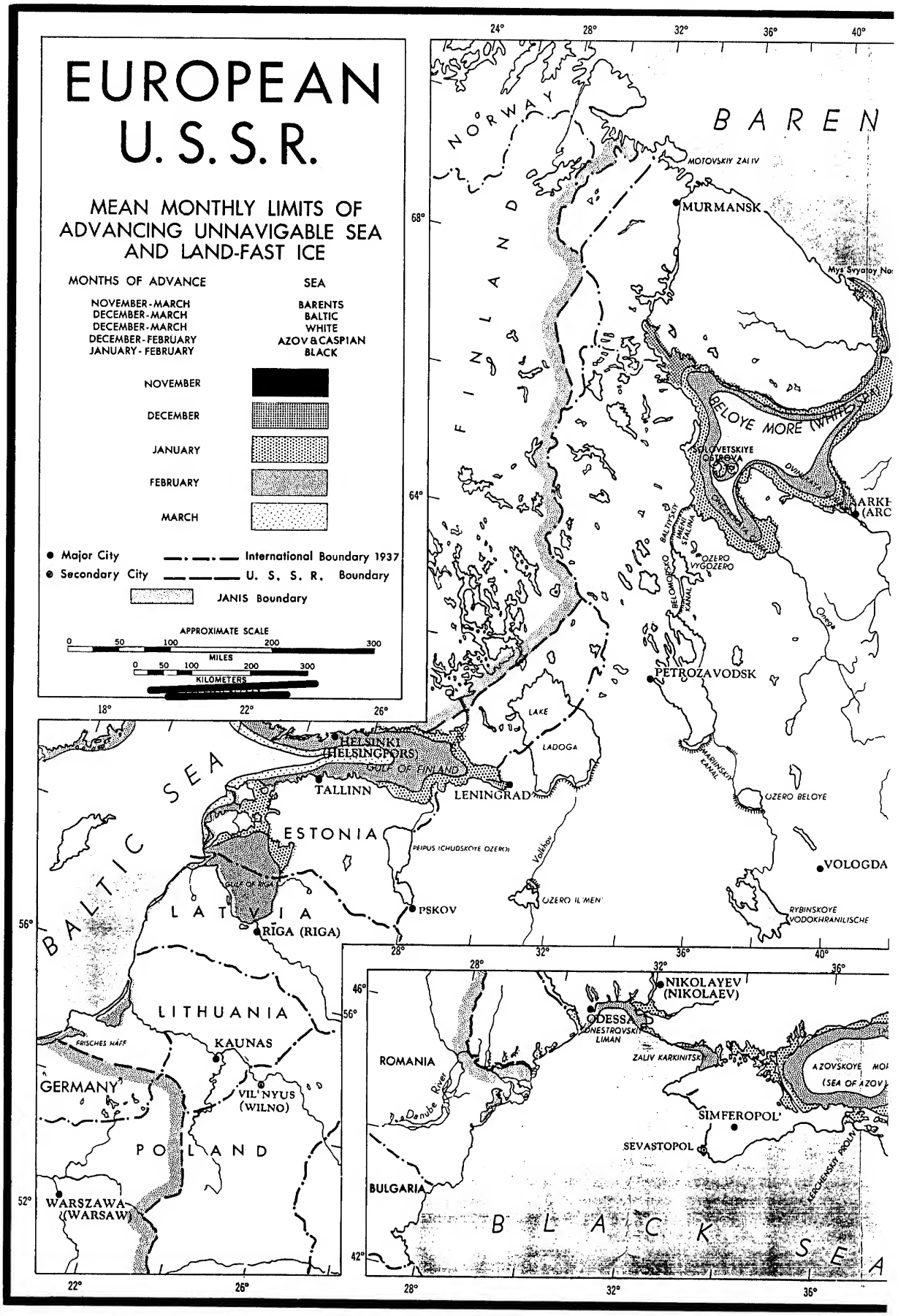
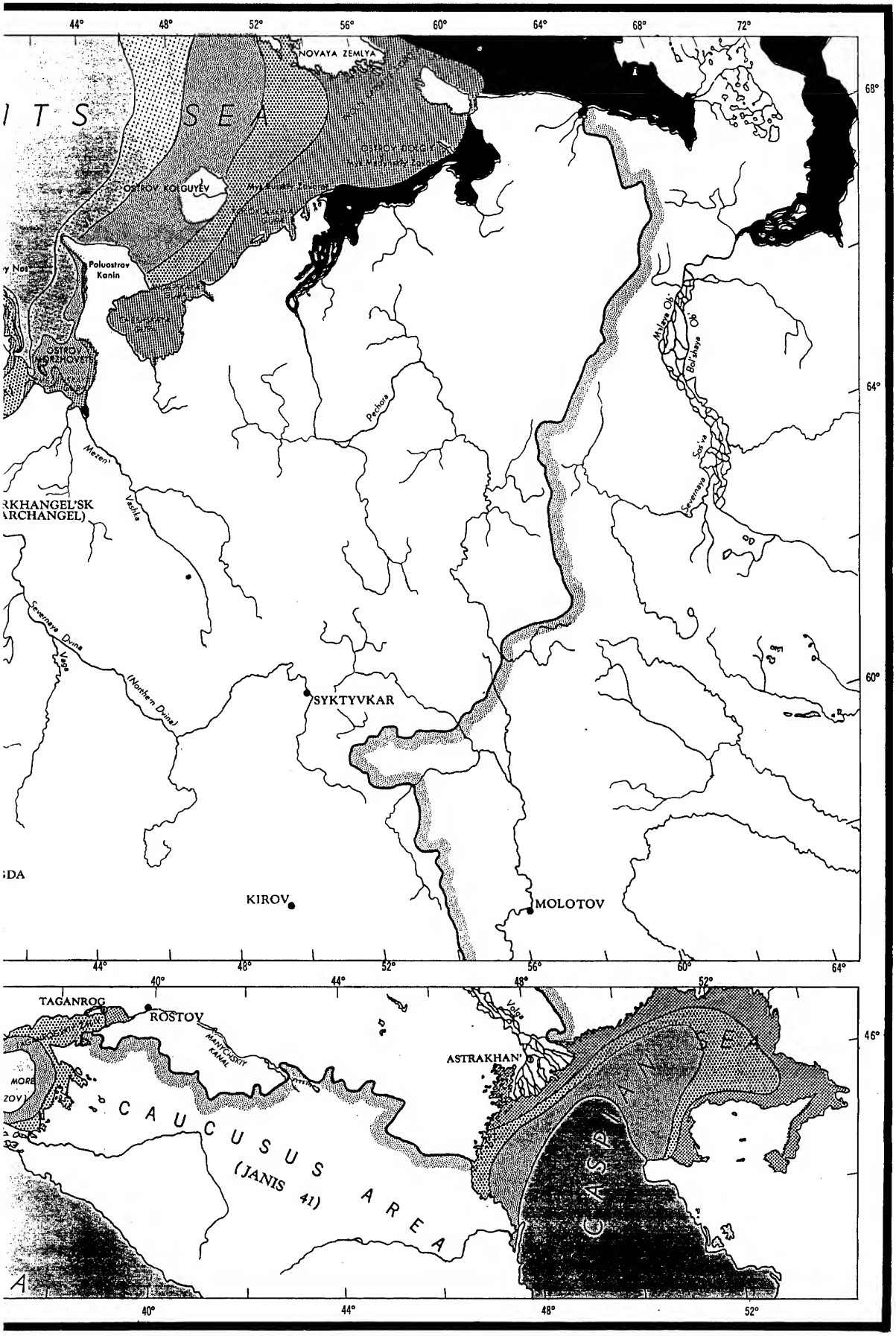


FIGURE I – 7
MONTHLY LIMITS OF ADVANCING ICE
JANIS 40
CONFIDENTIAL



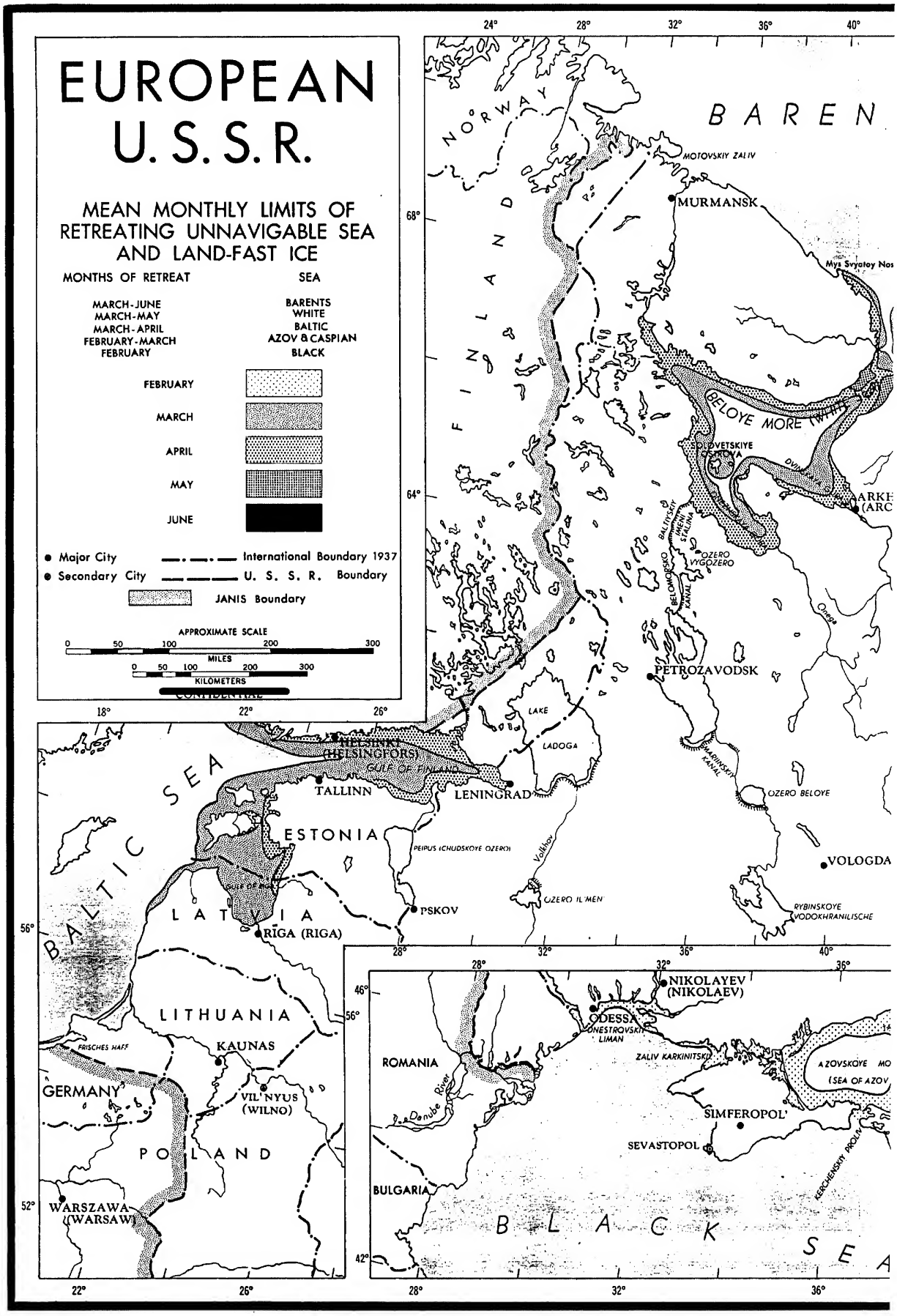
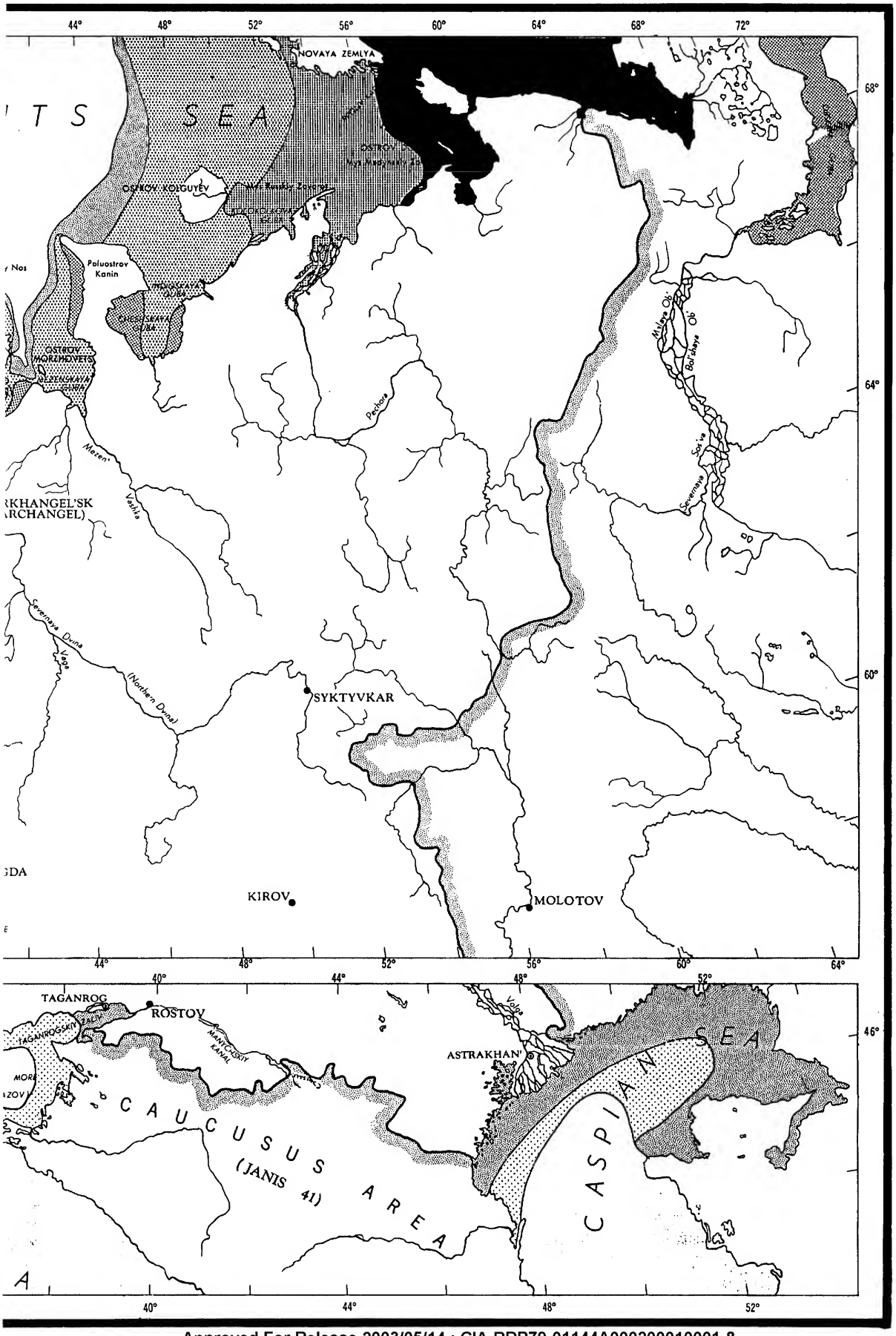


FIGURE I - 8
MONTHLY LIMITS OF RETREATING ICE
JANIS 40
CONFIDENTIAL



The south or Black Sea coast has much less severe weather conditions than the other two sectors. Gales are recorded on 5 or 6 days per month from January to April, and seas are rough to heavy on 5 to 8 days a month during that period. The north coasts of the Sea of Azov and of the Caspian Sea are frozen for about 80 days from mid-December to mid-March, but ice breakers maintain limited navigation. Fog may hamper navigation on 5 to 10 days a month from December through March. Summer conditions are generally favorable, light seas prevailing from April through November.

(4) Chemical warfare operations

Highest frequency of winds less than 7 m.p.h. occurs in the morning and evening at most stations in this area; summer shows a higher seasonal frequency than the other seasons. There is more random variation in the frequency of winds of from 8 to 12 m.p.h. than of winds below 7 m.p.h.; summer and fall are slightly the most favorable seasons in wind speed; diurnal variations are random and no generalization can be made as to the relative favorability of one time of day. In winter, the atmosphere is usually stable, turbulence is primarily in connection with high wind velocities; the atmosphere is most stable at night and least stable in the afternoon. In summer, the atmosphere is frequently quite unstable, and instability is augmented by solar heating during the day; such unstable conditions are most frequent in the southern part of this area, and least frequent along the Arctic coast. Except in the extreme south, all winter precipitation falls as snow, considered as less effective than rain in removing gases from the atmosphere.

6. PORTS, SHIPPING, AND NAVY

The principal and secondary ports of European USSR are briefly discussed in geographical order within each classification in each of the three areas, beginning with the North Coast and followed by the West and South Coasts. Data on their natural and physical features and commercial and military significance are summarized in TABLE I-1. Minor ports and landings are more briefly summarized in TABLE I-2.

All ports are shown on the location map (FIGURE I-10).

Astrakhan', the only European USSR port of any importance in the Caspian Sea area, briefly discussed in A, (2), (d) of Topic 6, is discussed in detail along with the ports of the Caucasus Area in JANIS 41, Chapter VI, C.

Data on anchorages relating to the ports and landings are shown in TABLES I-1 and I-2. Anchorages relating to beaches are discussed in Chapter IV.

The available data on naval establishments at the ports are included as an integral part of the descriptions. Data on personnel, organization, and vessels of the Navy and Merchant Marine are not included in this topic, in view of the scheduled early publication of more recent and comprehensive basic intelligence on those subjects.

Shipping routes are briefed in Topic 6, B.

A. Ports

(1) General and pertinent characteristics

(a) Areal distribution.—Estonia, Latvia, and Lithuania were annexed and organized as Soviet republics in the summer of 1940, but those actions have not been recognized by the United States Government. Prior to the acquisition of the ports of these countries, East Prussia and part of Finland, the west coast of European USSR was a small section of the shores of the Gulf of Finland near Leningrad. Now the greatest concentration of important ports of European USSR is on the west coast, and the acquisition of numerous secondary and minor ports has placed the Soviet Union in a position to dominate shipping in this area.

The ports and landings are classified and distributed as follows:

NORTH COAST	WEST COAST	SOUTH COAST
	Principal Ports	
Arkhangel'sk	Leningrad	Odessa
Murmansk	Kronshtadt	Kherson
	Tallinn, Estonia	Sevastopol'
	Rīga, Latvia	Mariupol'
	Ventspils, Latvia	Rostov (na-Donu)
	Liepāja, Latvia	
	Klaipėda, Lithuania	
	Kaliningrad	
	Baltiysk	
	Secondary Ports	
Molotovsk	Oraniyenbaum	Nikolayev
Onega	Vyborg	Yalta
Belomorsk	Uuras	Feodosiya
Kem'	Makslakhden Satama	Kerch'
Kandalaksha	Koyvisto	Osipenko
Iokan'ga	Paldiski, Estonia	Taganrog
Polyarnyy	Pärnu, Estonia	
Vayenga		
	Minor Ports and Landings	
Amderma	Vilayoki	Ochakov
Khabarovo	Repola	Skadovsk
Guba Varneka	Lis'yenosskaya Gavan'	Khorly
Guba Belush'ya	Ust'ye	Yevpatoriya
Nar'yan-Mar	Luzhskaya Guba	Balaklava
Unskaya Guba	Narva, Estonia	Mys Kiik-Atlama
Solovetskiy	Kunda, Estonia	Genichesk
Guba Pon'gama	Loksa, Estonia	Azov
Keret'	Haapsalu, Estonia	
Guba Kovda	Rohuküla, Estonia	
Guba Bol'shaya Por'ya	Virtsu, Estonia	
Gavrilovo	Ainaži, Latvia	
Teriberka	Pavilosta, Latvia	
Port-Vladimir	Sventoji, Lithuania	
Bukhta Ozerko		

Note: The native spelling is used in this topic for the names of places and natural features in Estonia, Latvia, and Lithuania. Generally the more commonly known geographic place names and the functional names of port installations are retained in English.

(b) Conditions affecting navigation

1. PHYSICAL CLASSIFICATION.—Any type of harbors may be found among USSR ports. Natural harbors include the estuarine Arkhangel'sk and the inlet shelter of Murmansk. Leningrad is a partial natural harbor improved by artificial means, whereas Kronshtadt is almost entirely artificial. Classified by physical characteristics and the nature of artificial works there are harbors of all types—lagoon, jetty, island-protected, embayment, etc. The harbor at Kandalaksha is an embayment. Almost all of the harbors are subject to silting and the entrance channels and bottoms alongside the wharves must be dredged to maintain charted depths. During World War II, maintenance was inadequate and generally neglected, and depths may be less than stated.

2. ICE.—Navigation is hindered by ice on all three coasts but most severely on the north coast, where some ports are closed for seven months of the year. Belomorsk,

for example, is closed from mid-October until mid-May. Arkhangel'sk is normally closed from December to May; but in the winter of 1943-1944, to meet the war exigency, the facilities at Bakaritsa, 2 miles above Arkhangel'sk, were kept open to navigation. Opposite conditions prevail at Murmansk and nearby waters which are warmed by a branch of the Gulf stream, and navigation is rarely interrupted by ice. Ice in the open sea is more dangerous in the spring than in the fall.

On the west coast, Kronshtadt is icebound from November to April, but ice breakers are able to extend the navigation period. In severe winters navigation is stopped from January through March. Ice impedes navigation at Leningrad early in winter, but ice breakers extend navigation except for about 15 weeks, from late January to early May, when the ice is between 2 and 3 feet thick. In contrast, Ventspils and Baltiysk are generally open with icebreaker assistance, although ice may bar them from the open sea.

Ice presents a serious obstruction to navigation along the northwest part of the Black Sea and in the Taganrogskiy Zaliv (gulf). The rivers usually freeze over but the navigation period is extended with the use of ice breakers. The ports of Odessa and Kherson are usually kept open and the port of Sevastopol' is never icebound, but the ports of Mariupol' and Rostov are usually closed by thick ice.

3. WATER LEVEL.—The ports along the north coast are variously affected by the tidal rise. The high water springs are 18¾ feet at Iokan'ga, but only 3 feet at Arkhangel'sk (city). Tidal rise of water along the west and south coasts is small. In the western part of the Black Sea it is not more than 3.2 inches. The water levels at ports along all three coasts are affected by winds, atmospheric pressure, and the volume of water discharged from the rivers. The range in river and narrow inlet ports is generally greater than in coastal ports. The water levels in TABLE I-1 are referred to a low water datum, except where otherwise noted. The amount of silting in recent years precludes precise statement of depths.

(c) Status of ports.—Complete and detailed information as to the extent of war damage and subsequent reconstruction is not available. Aerial photographs provide a basis for description of the condition of the south coast ports as of 1944 and 1945. Generally the descriptions of the west and north coast ports are based upon prewar conditions.

Warehouses, transit sheds, petroleum-storage tanks, mechanical handling facilities, and shipbuilding and repair yards were damaged or destroyed at practically all ports. Many of the harbors had wrecks of vessels and floating dry docks, and frequently the protecting breakwaters were breached.

It is probable that the ports have been restored to their general prewar conditions, with some possibility of modification and enlargement at certain places.

(d) Clearance from ports.—The Baltic States ports frequently had dual-gage tracks on the wharves; but the Soviet program of conversion to 5'0" gage, combined with a shortage of rail steel, makes it improbable that the 4'8½" gage exists at any of the European USSR ports at the present time. Many of the ports, however, have narrow-gage lines, generally 60 or 75 centimeters; there are about 40 miles of meter-gage track in Latvia.

Rail clearance from the west coast ports is superior to that on the south coast, and greatly superior to clearance on the north coast. North coast rail clearance must utilize either the Murmansk – Leningrad line or the Arkhangel'sk – Vologda – Moscow line. These two lines are connected by a branch line between Belomorsk (Murmansk line) and Obozerskaya (Arkhangel'sk line). Rail lines from west coast ports connect into a fairly comprehensive railnet. Generally the railroads of the south coast ports connect into trunk lines to the north, but war construction provided a lateral coastal line which facilitates east – west movement.

Highways are distributed in a pattern similar to the railroads in the west and south coast areas, but are practically nonexistent in the north, where are found chiefly improved dirt roads which become almost impassable when deep rutted and frozen, and during thaws.

The inland waterways of European USSR are used to a great extent for the movement of bulk cargoes. More than one-half of the total movement consists of timber in rafts or barges. Minerals, particularly coal, and grain and construction materials are other important commodities moved.

An announced aim of the Soviet canalization program is to provide navigable water from all the coasts to Moscow. A tangible result completed in 1933 is the Stalin White Sea – Baltic Canal between the Gulf of Finland and Belomorsk on the White Sea. It is known that destroyers of the *Engels* class (about 314 to 321 x 30½ x 9¾ feet, 1,150 to 1,417 tons) used this canal during the war. This 500-mile inland route as compared with the 2,200-mile open-sea route is relatively very important.

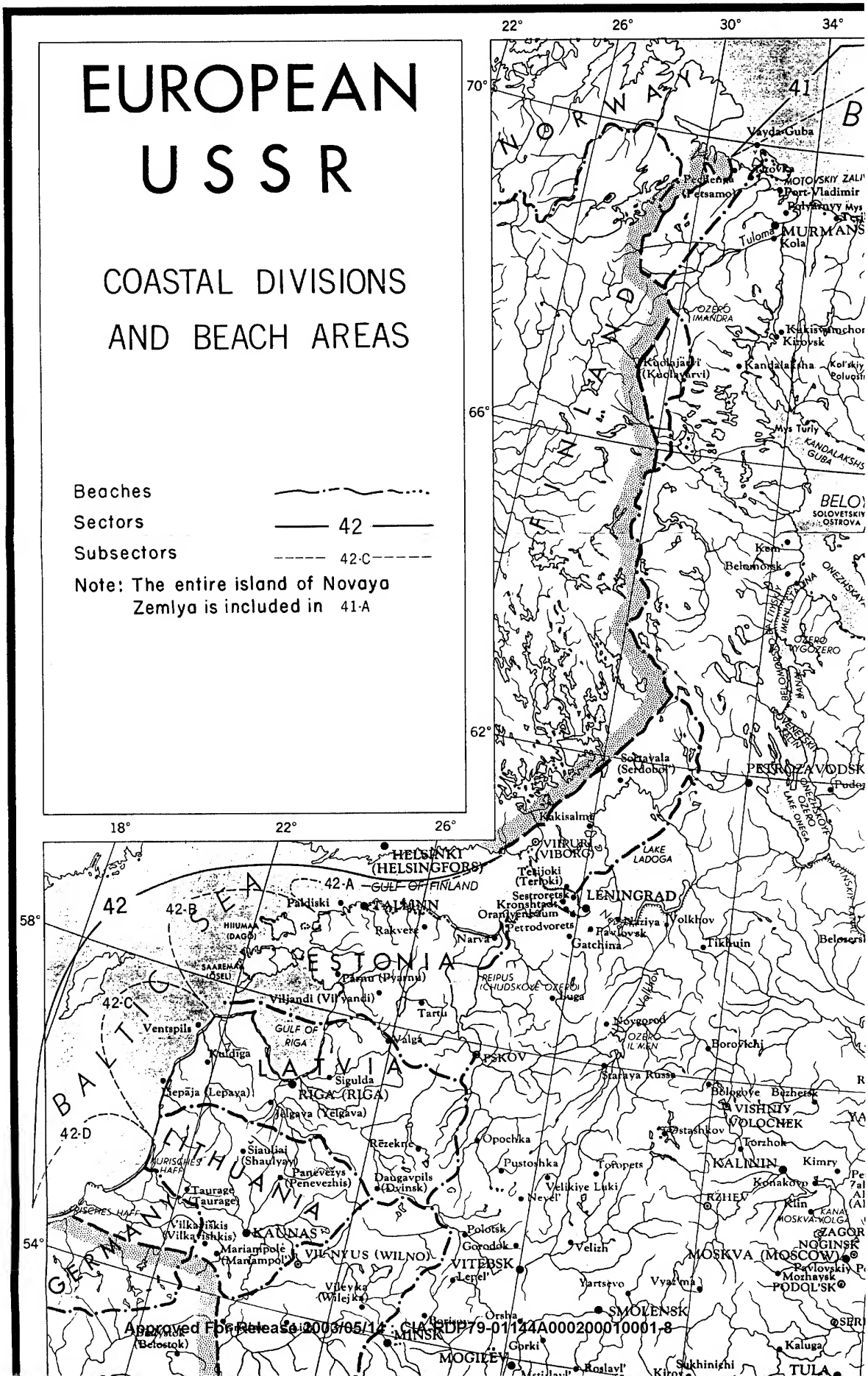
When frozen over, the inland waterways provide a much better sleigh highway than the low-grade, deeply rutted dirt roads, particularly in the northern areas.

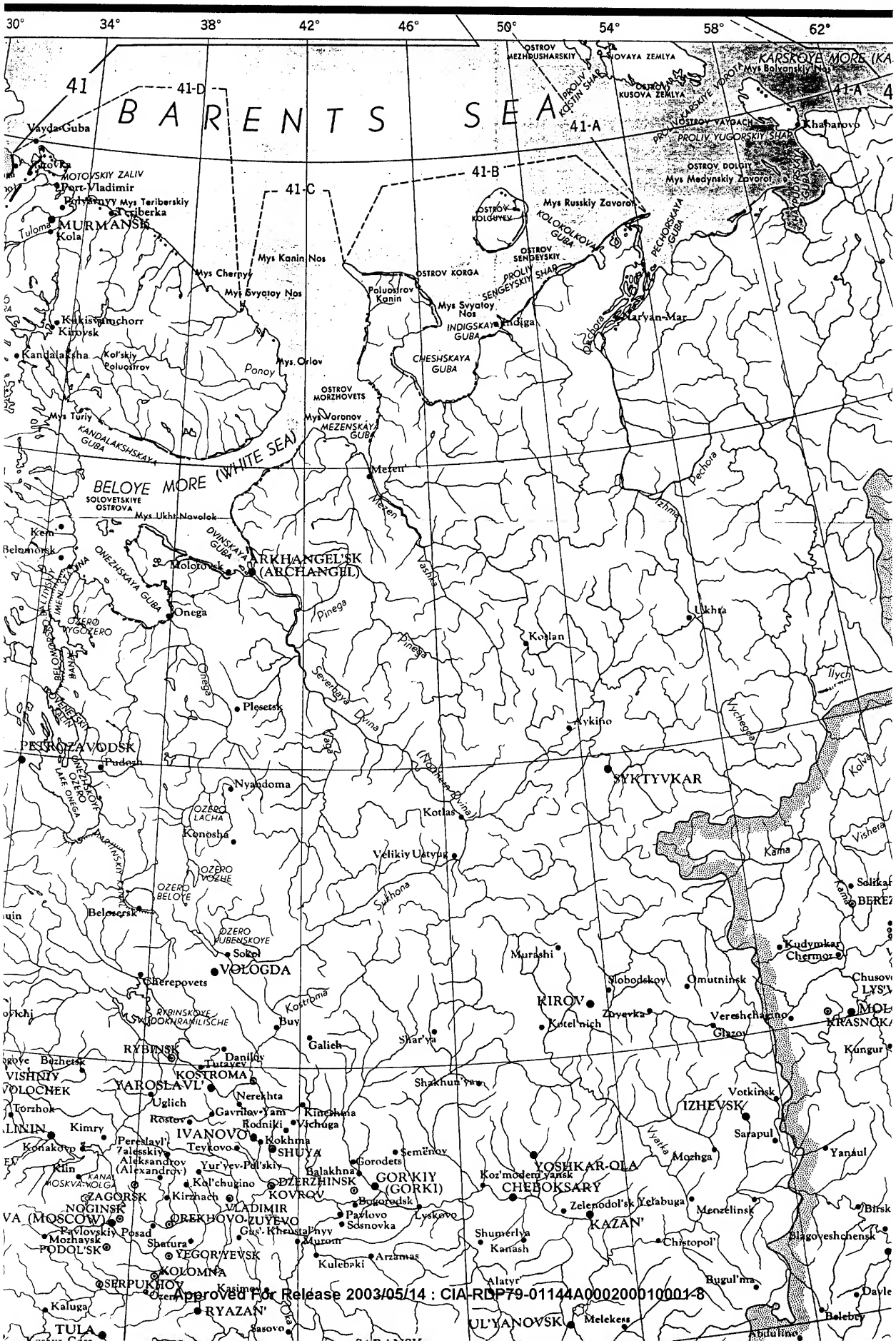
(e) Methods of operation.—The large amount of bulk commodity traffic has governed the design of port facilities. At ports such as Arkhangel'sk and Leningrad a considerable amount of the wharfage is located on islands or detached moles, which have no connections with the mainland for inland clearance. This is particularly true for timber-handling wharves, where timber is landed from rafts or barges floated down the rivers and then outloaded into deep-draft vessels. Facilities of this nature have relatively little value for operations involving the discharge and inland clearance of general military cargo.

Many quays in old sections of the ports have narrow aprons which restrict vehicular clearance of cargo. In many places with railroad trackage on or near the quays, the rail clearance potential is limited by a single-track line out of the yards. Often the paved streets, frequently cobblestones, lead to nearby industrial plants, and beyond them deteriorate to low-grade dirt roads.

Mechanization of port operations is about on a par with other forms of transportation. To facilitate discharge of lend-lease cargo it was necessary to include cargo-handling equipment. In many places coal bunkering is by manual methods. Grain-handling ports, however, generally have an adequate amount of mechanical equipment. Floating cranes appear to be deficient in number and in capacity for handling large and heavy cargo. Most of the cranes are of only about 3-ton capacity and possibly old. War damage to mechanical equipment was extensive.

(f) Trade of ports.—Foreign trade is a government monopoly and fluctuates to meet the planned economy. Imports have been limited to vital factories, machine tools, oil-well equipment and pipe, some metals, raw cotton, and rubber. At Murmansk, however, a large percent of import tonnage is coal from Spitzbergen, where the Soviets have a concession; in 1936 a total of about 475,000

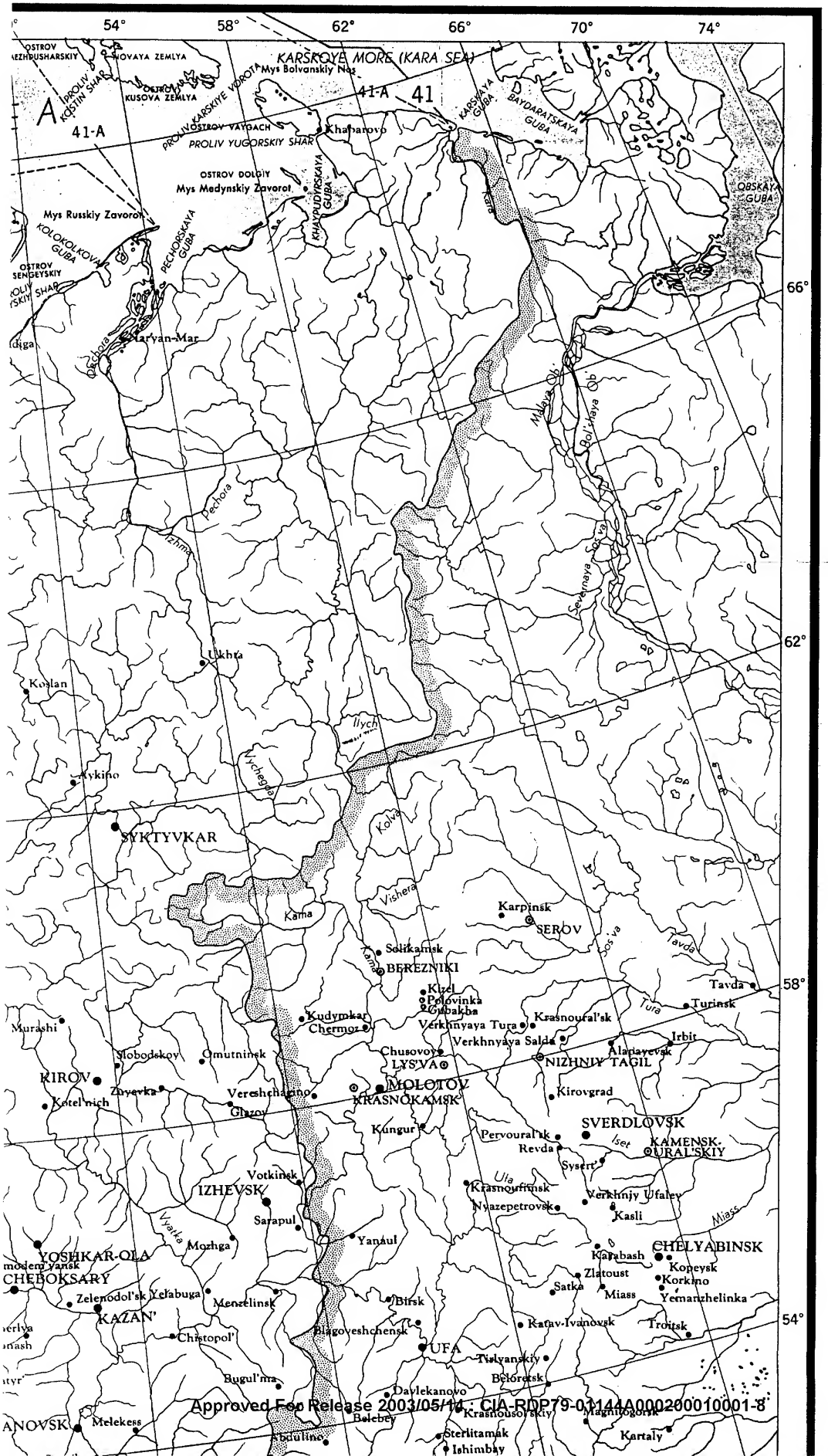


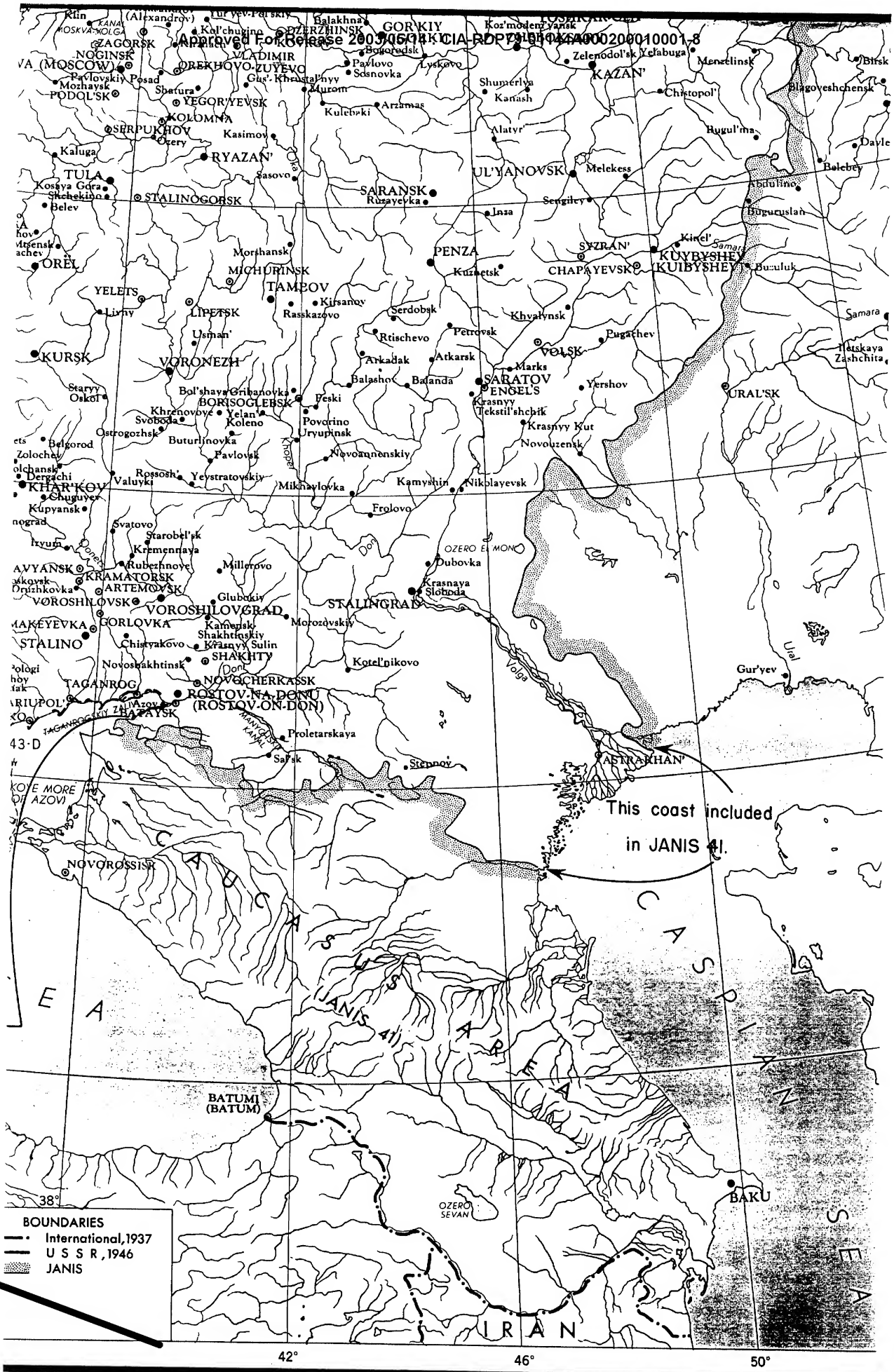


(9)

FIGURE I-9
COASTAL DIVISIONS AND BEACH AREAS
JANIS 40

[redacted]





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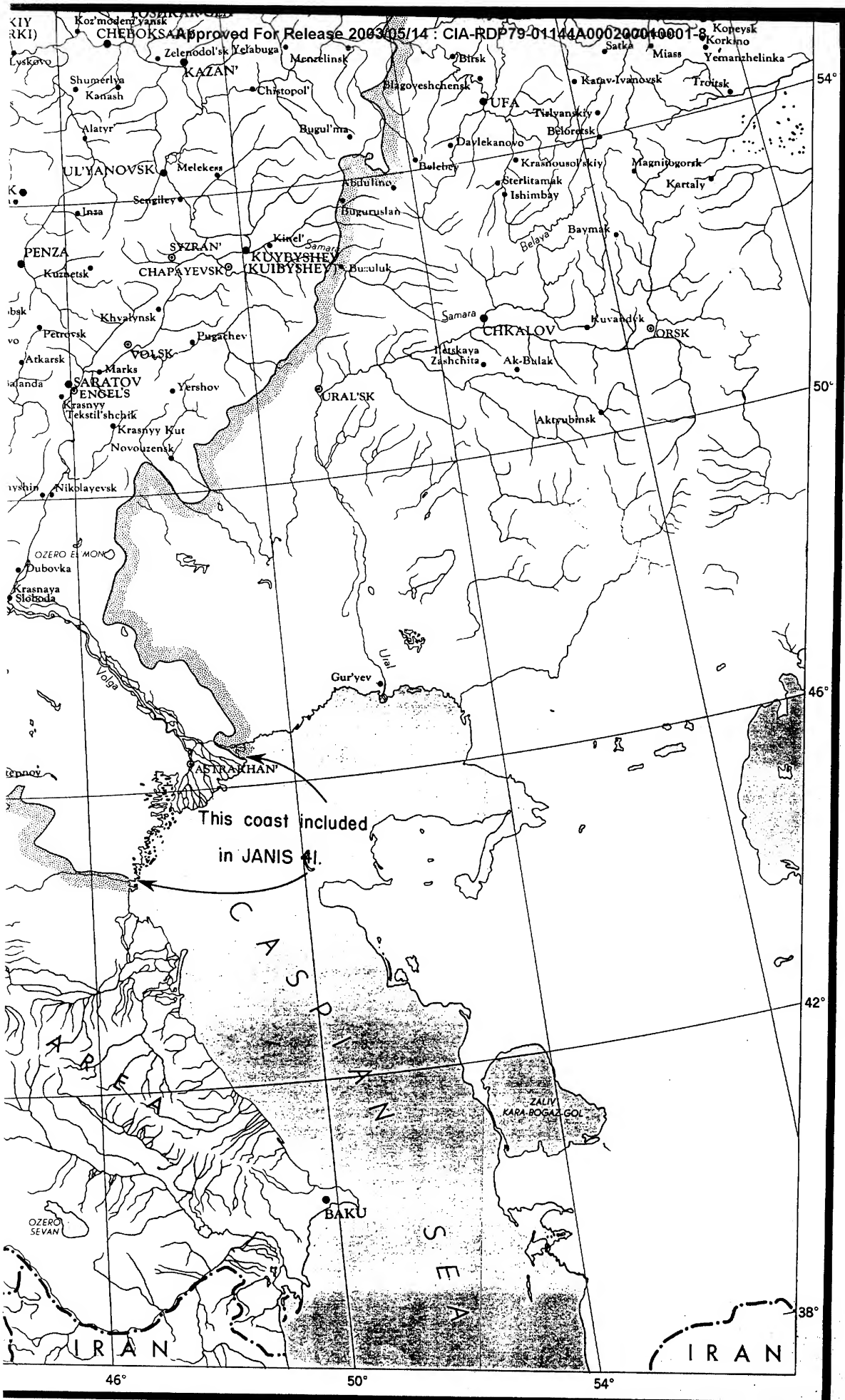

tons of coal were imported by the USSR from those mines. A large amount of Baltic and Black Sea traffic, since the end of the war, has been the movement of dismantled factories and plants into the Soviet Union.

Grain and timber are the leading exports of the USSR. They likewise comprise the bulk of coastwise shipping traffic, timber from the north and grain from the south and west. Coal and ore in large quantities are moved between ports on the Black Sea – Sea of Azov routes, particularly between Kerch' and Mariupol'.

A comparison in short tons of the trade through European USSR ports to total USSR trade is:

	1934	1935	1936	1937
IMPORTS:				
European USSR	605,337	680,300	632,013	632,431
Total USSR	1,130,045	1,387,896	1,273,453	1,417,309
EXPORTS:				
European USSR	10,977,256	11,656,143	9,984,736	7,964,069
Total USSR	19,114,268	18,949,240	15,657,259	14,296,269

Statistics on the amount of trade through the former Finnish ports are not available. Available statistics in short tons for the ports of the Baltic States and Kaliningrad of former East Prussia are:

IMPORTS:	1934	1935	1936	1937
Estonia	315,044	325,614	422,625	446,398
Latvia	950,095	1,098,706	1,156,695	1,284,408
Lithuania	No data	No data	No data	1,221,822
Kaliningrad	No data	1,142,000	1,398,000	1,717,000
EXPORTS:				
Estonia	575,656	527,360	499,380	518,307
Latvia	1,040,000	1,094,374	1,110,963	2,016,843
Lithuania	No data	No data	No data	695,736
Kaliningrad	No data	259,000	258,000	241,000

There was also a great volume of domestic commerce and coastwise shipping. Statistics are inadequate to present a definite picture of cargo movement, but available information indicates the relative importance of coastwise shipping and the extent to which it governs the methods of port operation. In 1937 the total maritime cargo carried in Soviet shipping amounted to about 23,000,000 tons. Overseas trade amounted to about 6,000,000 tons and the remainder was coastwise. The coastwise shipping trade of the former East Prussian ports in short tons was:

Kaliningrad (Königsberg):	1936	1937
Receipts	2,800,000	1,383,000
Shipments	600,000	723,000
Baltiysk (Pillau) all trade	32,290	36,266

The year and amount of highest tonnage of trade through the individual ports are shown in TABLE I-1.

(2) Summary of ports

(a) North Coast ports

1. PRINCIPAL PORTS.—For summarized details see TABLE I-1 and for location see FIGURE I-10.

a. Arkhangel'sk.—The city is on the right bank of the Severnaya (North) Dvina, about 26 miles above its deltaic mouth. Its population in 1939 was 281,091, presumably at the height of the timber-handling season. From the outer port of Ekonomiya the harbor extends along the banks of the channel Maymaksa past several island facilities (including Solombala) and Arkhangel'sk railroad station on the mainland left bank opposite the city, and 5 miles farther to the last sawmill above Bakaritsa. The port is the leading timber-milling and shipping point, handling in 1935 about 8-1/3 billion board feet. In the preceding year, 546 vessels of unreported tonnage called at Arkhangel'sk.

Normally the port is closed by ice, but during the winter of 1943-1944 ice breakers kept navigation open at Bakaritsa 2 miles upstream. Most of the wharves are constructed of wood, but those at Bakaritsa are reinforced and during the war received 67-ton tanks with a base area of 10 square feet. At Ekonomiya there are railroad tracks which are connected with Arkhangel'sk by a permanent bridge; but crossing of the Severnaya Dvina is by ferry or temporary ice bridge in winter to the railroad station and the main line south. Facilities at Arkhangel'sk station and Bakaritsa are the only ones not requiring water crossing for clearance to the interior. Motor-vehicle operations are impeded similarly, as well as by low-grade roads. A naval establishment is at Arkhangel'sk.

b. Murmansk.—Murmansk (1939 population, 117,054) is the most important commercial port on the north coast and the western terminus of the Northern Sea Route to the Far East. Located in the virtually ice-free Kol'skiy Zaliv (gulf), it has a roadstead that will accommodate a ship of any size. The Soviet announced development to a 5,755,000-ton annual cargo turnover by 1942 was interrupted by the war, and approximately two-thirds of the city and port damaged. Lend-lease supplies were delivered here for movement to the interior via the Leningrad – Murmansk railroad. Apatite, timber, flax, and fish products are exported; coal from the Soviet concession in Spitzbergen is the principal import. An integral part of the Northern Fleet is located at Murmansk.

2. SECONDARY PORTS

a. Molotovsk.—Construction of this port was started in 1936 to provide a White Sea port that could be kept open the year round for commerce and for the repair and construction of both commercial and naval vessels. It is located on the estuary Nikol'skoye Ust'ye, about 19 miles west of Arkhangel'sk. The dredge-maintained channel was adequate in 1944 for 28-foot-draft vessels. Construction and improvement were continuing in 1945, and the shipyards purportedly will be large enough to handle capital ships. An extensive amount of readily available timber makes Molotovsk an efficient location for construction of wooden ships; steel would have to be brought in, but timber could be loaded in the returning bottoms. Some naval facilities are adjacent to the commercial harbor.

b. Onega.—This shallow-draft port, open about 5 months of the year, is a timber-exporting point located about 4 miles inland on the bank of the river Onega, which empties into the White Sea.

c. Belomorsk.—Belomorsk is the northern end of the Stalin White Sea – Baltic Canal (Belomorsko-Baltiyskiy Kanal Imeni Stalina). Its artificial harbor is about 1 mile wide by 1¾ miles long, with an 800-foot-wide entrance about 26 feet deep. A shallow-draft port, its dredged channel has a least depth of about 16 feet.

d. Kem'.—The harbor is between the islands Ostrov Rabocheostrovsk and Ostrov Yak; and the deepwater port for Kem' is located on the east side of Ostrov Rabocheostrovsk, which lies parallel to the mainland. A large railroad-served pier has 28- to 32-foot depths alongside. The town is at the head of a 4-mile-long estuary on the west coast of the White Sea. It is a small sawmilling and fishing town with small military supply installations.

e. Kandalaksha.—The harbor is an embayment practically landlocked, at the head of the Kandalakshskaya Guba (gulf). A pier and two shore wharves, believed tim-

ber-decked open-piling structures, provide about 870 linear feet of wharfage in 10 to 20 feet of water. There are numerous protected anchorages in 6 to 38 fathoms over a bottom of mud over rock. The Niva mouth is about ½ mile north of the wharves.

f. Iokan'ga.—This advance antisubmarine and minesweeping naval base has little commercial importance. Prior to World War II it was a small fishing port. The principal pier is about 400 feet long and 60 feet wide in 30 feet of water at the end, and about 15 feet at the root (1944). A June 1944 report states there are several smaller piers. All are believed of timber construction. The harbor is a sheltered area between the mainland and a group of off-lying islands on the Murman Coast. There is a commodious and sheltered anchorage for several large vessels. The base activities are under the jurisdiction of the White Sea Forces Command.

g. Polyarnyy.—The headquarters of the Commander-in-Chief of the Soviet Northern Fleet are located at this normally ice-free naval base harbor. The base facilities are at the head of a small bay, Yekaterininskaya Gavan, which opens onto the large inlet Kol'skiy Zaliv. There are three larger wharves and several smaller ones with alongside depths ranging from 8 to 31 feet. Polyarnyy was a principal submarine base during the war. It is reported that the brick administrative buildings and barracks show rapid deterioration.

h. Vayenga.—Vayenga Naval Base is about 14 miles northeast of Murmansk and is the chief operating base of the Soviet Northern Fleet. Due west of the base is an airfield. The Fleet anchorage is in the Guba (bay) Vayenga, which opens into Kol'skiy Zaliv. In October 1945, a pier for capital ships was being constructed.

(b) West Coast ports.—During the twenty years preceding the annexation of the Baltic States, the USSR had only the one principal commercial port, Leningrad, and the secondary port of Oraniyenbaum. The acquisition of Estonia, Latvia, Lithuania, part of Finland, and East Prussia increased the principal Soviet commercial ports on the Baltic from one to eight. (Kronshtadt has been the most important naval base in the area for some time.) Secondary ports were similarly increased, and practically all of the minor ports were gained in this territorial acquisition.

1. PRINCIPAL PORTS.

a. Leningrad.—The former capital of Russia is on the Nevskaya Guba (bay) at the mouth of the Neva, which flows into the head of the Gulf of Finland. The city is a large industrialized center with a 1941 population of about 3,500,000. Prior to the war it was the main foreign commercial port of the Soviet Union, and about three-fourths of all USSR shipbuilding was done at the yards in the port area.

The upper harbor in the mouth of the Neva is connected by a dredged channel with the breakwater-protected lower harbor south of the river mouth. Bulk commodity terminals are in the lower harbor, and the general cargo wharves are in the upper harbor. Nearly 30,000 linear feet of the port's wharfage have alongside depths ranging from 18 to 30 feet. An announced Soviet intention is to develop the river portion to the "largest river port in the world". Eleven railroad lines radiate from Leningrad, and good highways lead from the city. More than 500 bridges of all types and sizes are within greater Leningrad.

b. Kronshtadt.—This artificially formed port on the south side of Ostrov Kotlin, 13 miles west on the Leningrad approach channel in the Gulf of Finland, was a leading port of the older Tsarist Russia. The dredging of the channel to Leningrad, however, resulted in practical elimination of Kronshtadt as a commercial transshipping point. It is the most important naval base in the Baltic and, with Leningrad, the vital nerve center of the Soviet Baltic Fleet. The base has repair facilities for capital-size vessels There are several large dry docks, and the canal basins which course into the developed part of the base can be dried.

There are off-lying fortifications, three of them causeway-connected to Kronshtadt. A large shed housed at least 80 motor torpedo boats. Ten chambers with a concrete roof for bomb protection contained jetties and repair facilities. The extensive wharfage on the isolated mole protecting the harbors could serve only as a transshipping facility for movement to the island or the mainland. During the winter travel over the ice to the mainland is by motor vehicle and sleigh.

c. Tallinn, Estonia.—Tallinn, the capital of Estonia, is on the southern coast of the Gulf of Finland. The harbor area is comprised of two artificial breakwater-protected harbors, Old Harbor and New Harbor. On the bay Teliskopli Laht are two shipyards, and in the New Harbor area is another small yard. A small naval basin in the rear of the Old Harbor was the base for the small Estonian Fleet and was used likewise by the Soviets during 1939-1941. The Germans later used the port, principally as a refueling point. Tallinn is the headquarters of one of the five Soviet naval districts in the Baltic area. A Finnish source (1944) stated that the main base of the Soviet Baltic Fleet had been moved here from Kronshtadt, but this is not confirmed. The area was extensively damaged or destroyed.

d. Rīga, Latvia.—Rīga is the main port of Latvia. The harbor comprises the river Daugava and the tributaries from its mouth for 23 miles upstream. The city is about 10 miles upstream and the principal wharves are in this stretch and at the city. Scattered along the 13 miles above the city are shallow-draft wharves for river craft and timber rafts and barges. The more important wharves are mainly of masonry wall construction retaining solid fill. Railroad trackage is on or available to most of the important wharves.

e. Ventspils, Latvia.—Ventspils is on the river Venta about 11 miles south-southwest of the entrance to the Gulf of Riga. The outer harbor is formed by two curved timber breakwaters. The commercial harbor extends from the mouth of the Venta to a point about 8 miles upstream with wharves on the right bank. The 450- to 800-foot-wide river is about 25½ feet deep for a distance of about 2,000 yards upstream.

f. Liepāja, Latvia.—Liepāja, on the Baltic Coast in the southwest corner of Latvia, is principally a grain- and lumber-exporting point and ranks commercially next to Rīga among the Latvian ports. The harbor consists of an outer harbor and a commercial harbor within it in the lower part. At the north end of the outer harbor an arm known as Naval Harbor Canal (Kara Ostas Kanāls) extends inland to a naval basin. Formed in the north side of the basin are two 620-foot by 92-foot by 30-foot-deep dry docks. On the south from the outer harbor a Harbor Canal leads inland to the lake Liepājas Ezers, and this canal is a Winter Harbor. The more important wharves are in Commercial Harbor, Harbor Canal, and Winter Harbor. The Soviet Navy utilizes the outer harbor and the naval portion.

g. Klaipėda, Lithuania.—This port, the most important of Lithuania, has an important transit trade in

timber, grain and other agricultural products. The entrance and northern part of Kurisches Haff comprises the harbor. Normally accessible to vessels of 22-foot draft, the port had so silted by 1945 that vessels drawing no more than 16 feet could enter. The most important facilities are on the east side of Kurisches Haff, between the entrance channel and the mouth of the river Dange, which flows through the town.

h. Kaliningrad.—This river port, formerly Königsberg, East Prussia, has extensive facilities for oceangoing vessels in the mouth of the river Pregel', which flows into the eastern end of Frisches Haff, a shallow lagoon on the Gulf of Danzig. The harbor consists of the Pregel' and its two branches. Off the Pregel' are three large artificial basins, two of which contain 7,800 linear feet of wharfage with alongside depths of 23 to 27 feet. A naval base with piers and wharves was in the area. An unconfirmed report states that the Soviet Government was stripping the port of undamaged equipment.

i. Baltiysk.—Formerly Pillau, East Prussia, this port is on the eastern shore of the Gulf of Danzig, at the seaward entrance to the ship channel to Kaliningrad. Its harbor is artificially formed by breakwaters. Several small basins open from the inner and outer harbors. East of the commercial harbor is a recently constructed five-basin naval harbor. Submarines were based at Baltiysk.

2. Secondary ports

a. Vyborg.—The former Finnish port of Viipuri is on the bay Port Vyborg, on the north shore of the Gulf of Finland. The city is a lumber and manufacturing center and prior to the war it exported more lumber than any other port in Europe. The city and suburbs are on the mainland and causeway- or bridge-connected islands. The sea end of the Saima Canal (Saymenskiy Kanal), which provides access by small steamer to the Finnish lake system, is at Vyborg. There was a seaplane base at the port.

b. Uuras.—This port, also formerly Finnish, has no trade tributary area of its own and is important only as the outer port for Vyborg.

c. Makslakhden Satama.—This former Finnish port is on the eastern side of Vyborgskiy Zaliv at the head of a large inlet extending southeast from Reyd Uuras. It serves the nearby town of Rëmpeti, and the principal export is lumber. Its nine piers are in shallow water, but most of them are served by railroad tracks.

d. Koyvisto.—This former Finnish port on the north coast of the Gulf of Finland is a relatively small port with traffic in timber, coal, and salt. The small harbor area has water depths that are less than 5 fathoms, but oceangoing vessels can berth alongside some of the facilities.

e. Oraniyenbaum.—Prior to the annexation of the Baltic States, Oraniyenbaum, in addition to Leningrad, was the only Baltic commercial port of any importance available to the Soviet Union. Opposite Kronshtadt on the south side of Nevskaya Guba at the eastern end of the Gulf of Finland, the port provides an artificial harbor formed by breakwaters. During the war a minor naval operations base was located here.

f. Paldiski, Estonia.—On the south shore of the Gulf of Finland, Paldiski is an ice-free alternate port for Tallinn and a fishing center. Its artificial harbor is protected by breakwaters. Off the port in Paldiski Laht is an extensive anchorage area in 6 to 16 fathoms over a mud bottom.

g. Pärnu, Estonia.—This port in the mouth of the river Pärnu, which empties into Pärnu Laht in the northeast corner of the Gulf of Riga, is an important shipping point for lumber and agricultural products.

(c) South Coast ports.—The south coast was subjected to extensive war damage and the concentrated destruction in the ports was exceptionally effective in many of them. Details as to the extent of damage and the amount of reconstruction are not available. The quayage listed in Table I-1 includes damaged quayage (1945) which averages about one-third of the total. The months in which the USSR military forces reoccupied the principal and secondary ports are:

Rostov	Feb. 1943	Kerch'	Apr. 1944
Taganrog	Aug. 1943	Odessa	Apr. 1944
Mariupol'	Sep. 1943	Feodosiya	Apr. 1944
Kherson	Mar. 1944	Yalta	May 1944
Nikolayev	Mar. 1944	Sevastopol'	May 1944

1. Principal ports

a. Odessa.—This city is one of the largest of the USSR and the port is the leading foreign-trade point on the Black Sea. It is located on the southwestern shore of the Odesskiy Zaliv (bay) in the extreme northern part of the sea, west of midway between the mouths of the Yuzhnyy (South) Bug and the Dnepr on the east and the Dnestr on the west. The main part of the harbor is sheltered on the east by a curving breakwater and on the north by a detached breakwater parallel to the shore. North of the main part is a dog-leg breakwater and a detached breakwater protecting the petroleum and working part of the harbor. In 1945 only about 7,500 linear feet of the total wharfage was usable.

b. Kherson.—The port and town on the Dnepr comprise an important trading center for the area. The city is on the right bank of the Dnepr at the confluence of the shallower Koshevaya, but its port facilities are on both banks of the Dnepr and along the Koshevaya. Approach from the Black Sea is by a 50-mile channel through Dneprovskiy Liman and thence through the Rvach entrance through the deltaic mouth of the Dnepr to the city. The only dry dock building yard in the USSR is reported to be located at Kherson.

c. Sevastopol'.—The harbor of Sevastopol' is said to be the safest in the Black Sea. It is located on the western coast of the Crimean Peninsula and consists of Sevastopol'skaya Bukhta, a well-sheltered bay with numerous smaller bays and coves indenting its shores, and several smaller bays. The port is primarily a naval base. The operating and administrative headquarters of the Commander-in-Chief of the Black Sea Fleet were located here until the port was captured by the Germans in July 1942.

Sevastopol'skaya Bukhta never freezes over. The bay and developed harbor areas could accommodate the entire Black Sea Fleet, consisting of 1 battleship, 5 cruisers, 19 destroyers, about 50 submarines, and about an equal number of auxiliaries at anchor and at mooring buoys. Most of the facilities were designed for naval use, but there are commercial facilities which have been little used for that purpose.

Shipyard facilities include slips and building ways large enough for destroyers, and one large dry dock for ships of 30,000 tons. Fleet maintenance and outfitting is carried on here, but the principal building yards are at Nikolayev.

The submarine pens or motor torpedo boat stalls and workshops in Quarantine Bay are practically the only in-

stallations which were not extensively damaged or destroyed during the war.

d. Mariupol'.—Mariupol' is the principal port of the Sea of Azov, and ranks second to Odessa among South Coast ports. The city had a 1939 population of about 222,400. The weight tons of foreign cargo trade handled through this port has averaged from two to four times the amount through Odessa, but consists chiefly of heavy bulk commodities. In 1936 the foreign and domestic trade of this port amounted to about 3,860,000 short tons. The town has a wide range of industry, including steel mills, foundries, machine shops, armament and other factories, flour mills, and a shipyard. It is the main shipping point for Donbass coal, and is a principal grain-shipping port.

The commercial part of the port, consisting of a 3-basin inner harbor including the grain basin and an outer harbor, is about 3 miles southwest of the city, which is at the mouth of the river Kal'mius on the northern shore of the Taganrogskiy Zaliv (gulf). There is a newly constructed basin at the steel works on the north side of the Kal'mius.

e. Rostov.—Rostov-na-Donu, on both banks of the Don, is about 27 miles upstream from the river mouth and 64 miles from the roadstead, Bol'shoy Taganrogskiy Reyd, in the northeastern part of the Sea of Azov. It is the largest city on the southern coastal area of European USSR, with a 1938 population of about 800,000. The principal industries include fabricated metal and agricultural machinery manufacture. The chief exports are grain, coal, and timber. The limiting depth of 12 feet in the channel from the roadstead to the port necessitates transshipment at the roadstead to or from oceangoing shipping. Port facilities extend along the river front of Rostov and the contiguous town of Nakhichevan'. Floods inundate a considerable portion of the area on the left bank and impede clearance to the south. There was extensive war damage to the area, including destruction of all bridges.

1. Secondary ports

a. Nikolayev.—Nikolayev is on the left bank of the Yuzhnyy Bug, about 23 miles above the mouth. The city (1944 population, about 120,000) is the commercial and trading center of a large agricultural hinterland, and the port an important shipping point for grain and ore. Prior to the war Nikolayev was the foremost shipbuilding center of southern European USSR with the only yard in the Black Sea area capable of building capital naval ships. The town and yards occupy a promontory between the Yuzhnyy Bug and the Ingul rivers. The 28-foot-deep channel is maintained by dredging to the river mouth and about 20 miles beyond through Dneprovskiy Liman (Kherson or Dnieper Bay). There was extensive war damage and destruction.

b. Yalta.—Yalta is an ice-free port on the southeastern coast of the Crimean Peninsula, and is noted as a resort. Exports are locally grown fruits, leaf tobacco, and wine. There is no direct rail access, but paved and improved roads lead to nearby places with connections. The harbor is relatively small and port facilities are not extensive.

c. Feodosiya.—Feodosiya is near the root of the Kerch Peninsula (Kerchenskiy Poluostrov) about 70 miles northeast of Yalta on the eastern Crimean coast. The town of 29,600 (1930) is on the low shore at the western end or head of the Feodosiyskiy Zaliv (bay). It is the export center of the rich grain-producing region of the Crimean Peninsula and the principal commercial port of the Crimea. Damage and demolition to the port was considerable.

d. Kerch'.—Kerch' is on the northwestern side of Kerch Strait (Kerchenskiy Proliv), which connects the Sea of Azov with the Black Sea. The town, with a 1939 population of 100,000, is the Crimean industrial center for minerals, agricultural products, and fisheries. Considerable damage was done during the war to this port of call and important transshipment terminal for much Sea of Azov – Black Sea shipping. The Eastern Black Sea Pilotage District headquarters are located here. The port is icebound for about 40 days during January and Feruary.

e. Osipenko.—The town, with a 1939 population of about 51,600, is situated on level land backed by a bold tableland at the head of a bay, Berdyanskiy Zaliv, on the northern coast of the Sea of Azov. It is a principal grain-shipping port for southern European USSR and about 80% of its commerce is in grain. The harbor, ice-closed about 69 days a year, is formed behind a detached breakwater and an angular mole.

f. Taganrog.—An industrial and administrative center with a 1939 population of about 188,800, Taganrog is located on the northern coast of Taganrogskiy Zaliv, a gulf in the northern coast of the Sea of Azov. The harbor is comprised of 3 basins. Exports are grain and other agricultural products, and coal.

(d) Astrakhan'.—The town proper is on the left bank of the Volga (46°20'N, 48°02'E), about 60 miles inland from the Caspian Sea. The 1939 population was 253,655. Principal commodity movement through the port is transshipped petroleum and its products en route up the Volga or by rail to the hinterland from Baku and other Caucasian oil fields and refineries. About one-fourth of the USSR fishing catch is processed at Astrakhan'. The port occupies an 8-mile section on both sides of the Volga main channel and portions of four distributaries. Principal wharfage consists of about 12,000 linear feet in approximately 18 feet of water, and about 3,000 linear feet in about 12 feet. The entrance channel is about 100 miles long and the 12-foot inner roadstead is the limiting depth. The nontidal water level affected by winds and floods may rise as much as 13 feet and drop as much as 5 feet from mean level. Temperatures may drop to –22°F. in winter, with the river frozen for about 100 days. January mean temperature is 19.2°F. and July mean is 77°F. Two single-track railroad lines (5'0" gage) and one 26-foot-wide motor road lead from the area. Astrakhan' is the terminus of the Volga – White Sea – Baltic inland waterway system. There are about eight shipyards of various sizes and capacities. A Soviet Naval Academy and the headquarters of the Caspian Sea Flotilla are at Astrakhan'.

(e) Minor ports and landings.—These relatively smaller places are summarized in Table I-2.

B. Shipping routes

Except for a couple of light-traffic passenger routes there are no established shipping routes. Soviet ships are operating in the normal trade routes but there is no definite pattern discernible. The only unusual route is the northern route from Murmansk and Arkhangel'sk to the east coast of the USSR. This route is open from mid-July to the end of September, and occasionally during most of October, but ice-breaker assistance is required along virtually the whole route. Caspian Sea routes to and from Astrakhan' are predominantly tanker occupied.

NAME AND LOCATION		ANCHORAGE	ENTRANCE	
WEST COAST, SECONDARY PORTS (Continued):				
Paldiski, Estonia	59°21'N, 24°03'E	In Paldiski Laht in 6 to 16 fms. The best protected anchorage is SW of the old harbor in 8 to 9 fms. over mud.	Harbor opens directly into Paldiski Laht with depths ranging from 5½ to 22 fms.	The th mi old ha
Pärnu, Estonia	58°23'N, 24°29'E	An area of Pärnu Laht about 5 miles long and 2½ miles wide.	Across the bar, 58 to 116 yards wide and 18' to 20' deep.	Lowe Sa wi 15'
SOUTH COAST, PRINCIPAL PORTS:				
Odessa	46°30'N, 30°45'E	Extensive in bay off the port in 30' to 40' over soft mud and shells. In the harbor road, inside the breakwaters, is protected anchorage in 28' to 32'.	The E, and most-used entrance is 350' wide, 31' to 33' deep. N entrance is as wide but 30' deep.	Abou bo
Kherson	46°37'N, 32°37'E	Vessels moor to buoys in roadstead outside channel.	Dredged channel from Black Sea had a 1940 depth of 23 feet. Channel through bay had a bottom width of 350'. The Rvach entrance to the Dnepr is used by seagoing vessels.	Roac ab 40'
Sevastopol'	44°37'N, 33°32'E	For vessels of deepest draft and large enough for the Black Sea Fleet.	Entrance to main harbor is about 2,000' wide between 5-fm. contours; midchannel depths are 10 fms. deep. Channels to small harbors are well marked.	Cons Bl lor mi 10 ha
Mariupol'	47°05'N, 37°34'E	Several areas in 15' to 25.5' of water.	About 8½ miles long, 24' deep in 1941, with a bottom width of 328 feet.	More wa ar
Rostov	47°13'N, 39°42'E	Unlimited in roadstead, Bol'shoy Taganrogskiy Reyd. Vessels prohibited anchorage in reaches of river, canals, or dredged channels.	Approach channel is 250' wide and 12' deep. Except for the last 7 miles below Rostov, river channel is extremely sinuous.	A 3 wi str
SOUTH COAST, SECONDARY PORTS:				
Nikolayev	46°57'N, 31°59'E	Prohibited in harbor; vessels berth at wharves or moor to buoys close off the wharves.	A 43-mile-long, 150-foot-wide, 28-foot-deep channel from Black Sea, through Dneprovskiy Liman, thence up the Yuzhnyy Bug.	Mole ha ac Th sa de
Yalta	44°30'N, 34°10'E	About ½ mile S of town and harbor in roadstead in 10 to 13 fms. over mud and sand. An appreciable current and a swell when winds are southerly.	Entrance from south has 33' to 35' depths in fairway.	Abou ra pa pa th ab
Feodosiya	45°02'N, 35°24'E	In bay off the port in 5 to 12 fms. over soft mud. Sheltered from all but easterly winds.	Between breakwater and mole about 980' wide and had a depth of about 30'.	Mole ac ab
Kerch'	45°21'N, 36°29'E	Roadstead in W part of Kerchenskaya Bukhta for vessels drawing 12' to 13'. Vessels of deeper draft anchor in Yuzhnyy Peregruzochnyy Reyd.	About 3 miles long, 260' wide, and 19' deep in 1941. In 1938 it was 20.5'. Branch channels to Petroleum Pier and metallurgical works are about 15' deep.	Abou 22 to
Osipenko	46°45'N, 36°47'E	Extensive in Berdyanskiy Reyd in 18' over soft mud.	A 7½-mile-long channel from entrance to Berdyanskiy Zaliv to protecting breakwater is 300' wide at bottom and maintained at 22' deep.	A 2 be pa sh
Taganrog	47°12'N, 38°57'E	Extensive in Bol'shoy Taganrogskiy Reyd in 18' to 23' over good holding ground.	Dredged channel, 5¾ miles long, 180' wide at bottom, with least depth of 13' in 1938.	Thr fo te de

AND LOCATION	ANCHORAGE	ENTRANCE	HARBOR WATER AREA
CONDARY PORTS (Continued):			
59°21'N, 24°03'E	In Paldiski Laht in 6 to 16 fms. The best protected anchorage is SW of the old harbor in 8 to 9 fms. over mud.	Harbor opens directly into Paldiski Laht with depths ranging from 5½ to 22 fms.	The bay Paldiski Laht, between the island Väike-Pakri and the mainland, the new harbor and old harbor. The protected harbors are small.
58°23'N, 24°29'E	An area of Pärnu Laht about 5 miles long and 2½ miles wide.	Across the bar, 58 to 116 yards wide and 18' to 20' deep.	Lower sections of the Pärnu and Sauga (rivers) and a small winter harbor generally 12' to 15' deep in lower part.
INCIPAL PORTS:			
46°30'N, 30°45'E	Extensive in bay off the port in 30' to 40' over soft mud and shells. In the harbor road, inside the breakwaters, is protected anchorage in 28' to 32'.	The E, and most-used entrance is 350' wide, 31' to 33' deep. N entrance is as wide but 30' deep.	About 700 acres of enclosed harbor with 13' to 33' depths.
46°37'N, 32°37'E	Vessels moor to buoys in roadstead outside channel.	Dredged channel from Black Sea had a 1940 depth of 23 feet. Channel through bay had a bottom width of 350'. The Rvach entrance to the Dnepr is used by seagoing vessels.	Roadstead in the Dnepr has about 1,700 acres with 30' to 40' depths off the town.
44°37'N, 33°32'E	For vessels of deepest draft and large enough for the Black Sea Fleet.	Entrance to main harbor is about 2,000' wide between 5-fm. contours; midchannel depths are 10 fms. deep. Channels to small harbors are well marked.	Considered best and safest in Black Sea area. About 4 miles long and ¾ mile wide with midchannel depths from 8 to 10 fms. Numerous coves and harbors open from bay.
47°05'N, 37°34'E	Several areas in 15' to 25.5' of water.	About 8½ miles long, 24' deep in 1941, with a bottom width of 328 feet.	More than 250 acres of sheltered water area in the two port areas.
47°13'N, 39°42'E	Unlimited in roadstead, Bol'shoy Taganrogskiy Reyd. Vessels prohibited anchorage in reaches of river, canals, or dredged channels.	Approach channel is 250' wide and 12' deep. Except for the last 7 miles below Rostov, river channel is extremely sinuous.	A 3¾ mile stretch of the Don with 18' to 22' depths in midstream.
CONDARY PORTS:			
46°57'N, 31°59'E	Prohibited in harbor; vessels berth at wharves or moor to buoys close off the wharves.	A 43-mile-long, 150-foot-wide, 28-foot-deep channel from Black Sea, through Dneprovskiy Liman, thence up the Yuzhnyy Bug.	Mole-protected coastwise trade harbor is an area of about 40 acres with 12' to 23' depths. The foreign port, about the same size, is from 25' to 30' deep but mostly 28'.
44°30'N, 34°10'E	About ½ mile S of town and harbor in roadstead in 10 to 13 fms. over mud and sand. An appreciable current and a swell when winds are southerly.	Entrance from south has 33' to 35' depths in fairway.	About 35 acres, mole-protected, ranging from 27' to 33' in SE part and 9' to 10' in N and NW part. Recent reports indicate these charted depths considerably shoaled.
45°02'N, 35°24'E	In bay off the port in 5 to 12 fms. over soft mud. Sheltered from all but easterly winds.	Between breakwater and mole about 980' wide and had a depth of about 30'.	Mole-protected basin of about 64 acres with depths of 24', except about 3 acres of 19'.
45°21'N, 36°29'E	Roadstead in W part of Kerchenskaya Bukhta for vessels drawing 12' to 13'. Vessels of deeper draft anchor in Yuzhnyy Peregruzochnyy Reyd.	About 3 miles long, 260' wide, and 19' deep in 1941. In 1938 it was 20.5'. Branch channels to Petroleum Pier and metallurgical works are about 15' deep.	About 140 acres, 14' deep in S and 22' deep in N. Soft mud bottom.
46°45'N, 36°47'E	Extensive in Berdyanskiy Reyd in 18' over soft mud.	A 7½-mile-long channel from entrance to Berdyanskiy Zaliv to protecting breakwater is 300' wide at bottom and maintained at 22' deep.	A 25-acre mole-protected basin behind a 2,100' breakwater parallel to and ½ mile off the shore.
47°12'N, 38°57'E	Extensive in Bol'shoy Taganrogskiy Reyd in 18' to 23' over good holding ground.	Dredged channel, 5¾ miles long, 180' wide at bottom, with least depth of 13' in 1938.	Three mole- and breakwater-formed basins have a total water area of about 69 acres with depths (1938) of 13' and 14'.

TABLE I - 1 (Continued)

LINEAR FEET OF WHARFAGE IN VARIOUS DEPTHS						RANGE OF WATER LEVEL	ICE CONDITIONS	INLAN
...	1,855	775	...	...	2,630	No data available.	Interferes with navigation at times during the winter.	Rail and hig
...	...	3,120	..	...	3,120	Extreme recorded changes are 6′ above and 3′ below mean level, caused by winds.	Severely cold in winter with navigation blocked by ice from late December to early April.	Narrow-gage Pärnu to 5′0″-gage highways and Riga.
9,490	5,430	4,435	1,100	...	20,455	Nontidal. Maximum rise 2′7″ and maximum fall is 4′0″. Seasonal variation of Black Sea and outflow of rivers.	From 2″ to 4″ thick from December to March; 10″ in 1937. Usually kept open.	Three R.R. li sa. New coast to E northward.
...	...	4,120	...	...	4,120	Nontidal. Canalization above keeps level fairly constant except during spring floods when maximum rise may reach 8.5′.	Average 12″ to 14″ but may reach 27″ in severe winters. Usually kept open.	Single-track roads lead coast.
740	3,300	7,785	4,730	..	16,555	Nontidal, but regular fluctuations have a mean range of 28″.	Never frozen over.	Single-track feropol'. H into the net.
...	11,265	3,720	800	...	15,785	Nontidal, but there is a regular seasonal variation. Other variations caused by wind with a mean range of 6′.	Ice averages 105 days each year and 30″ thick. Easterly winds, if continuous, may pack the ice to 10′ thickness.	Double-track USSR net. roads lead the coast.
...	...	...	12,940	...	12,940	Nontidal. River level subject to considerable fluctuation. Level may be lowered by as much as 9′ and raised by as much as 10′.	Ice from 1′ to 1½′ thick generally closes river between early December and late March.	Double-track provide Ro rail connec Sea port. to be poor.
...	1,075	...	...	9,240	10,315	Nontidal. The variations are 2.6′ above or below mean water level, with fresh winds raising or lowering the level occasionally by as much as 3′.	River frozen about 92 days each year from mid-December to mid-March with ice about 20″ thick. Ice breakers keep port open.	Rail connectio work and r son, Odessa,
135	300	1,590	460	...	2,485	Nontidal. Range is about 2′ with maximum rise of 1′2″ and fall of 10″.	Ice-free.	No R.R. cle lead inland
340	3,790	600	...	...	4,730	Nontidal. Range of 2′ above and below the established datum of 5.25″ above average minimum recorded.	Open to navigation the year around. Ice breakers rarely required.	Rail line to Roads lead coast.
...	...	4,360	1,940	...	6,300	No lunar tides. A difference of 3′ has been observed.	Icebound for about 40 days during January and February.	Rail line to US seasonal low to W.
...	...	2,985	...	...	2,985	No lunar tides. Maximum fall about 1.5′ and rise about 3′ from mean sea level.	Ice forms from mid-December to late March. Open period of navigation is about 296 days.	Rail line con network. T roads lead fr
...	...	3,355	3,620	...	6,975	Nontidal. Range due to winds is about 8.5′.	Ice closes port from mid-December to March and may attain 2.2′ thickness.	Rail connecti double-track er roads lead lower type ro

LAND CLEARANCE	YEAR AND MAXIMUM KNOWN VOLUME OF TRADE THROUGH PORT	NAVAL ESTABLISHMENTS	BUILDING OR REPAIR FACILITY
highway connections.	1936 14,421	No data.	No data.
gage lines lead from to several points on ge line. Low-grade ays extend to Tallinn iga.	No data.	An aerial photo indicates minesweepers and gunboats were based here.	Engine repairs in government shops and other vessel repairs in privately owned yards.
R. lines lead from Odesew road leads along to E. Other roads lead ard.	1935 841,040	Not a naval establishment.	All shipyards were destroyed by the Germans but minor repairs were obtainable in 1944. The Marti yards built small warships.
ack R.R. and several lead inland and along	1935 266,806	No exclusively naval establishment but Comitern yards built motor torpedo boats and gunboats.	Several yards building and repairing commercial and naval vessels. The only floating drydock building yards in USSR are reported located here.
ack line through Siml'. Highways connect he Crimean Peninsula	1935 312	Prior to capture by the Germans, the port was the main base of the Black Sea Fleet and the headquarters of its Commander-in-Chief. Except for a small portion, the port was for naval use.	Several building and repair yards. Ships of all sizes up to destroyers were built here. The Navy Yard was primarily a maintenance yard. A dock on the north side would receive capital ships up to 30,000 tons.
rack line connects into net. Low-type (dirt) lead inland and along ast.	1935 1,495,233 (In 1932 about 1,775,800 short tons of coal was shipped.)	No data.	Present status of the two marine repair plants is unknown. The one in Zintsev Harbor could accomplish all commercial repairs required by the merchant fleet in the Sea of Azov.
rack lines to N and S e Rostov with the best nnections of any Black rt. Roads are reported oor.	No data.	No data.	Two small yards for river craft.
nections with USSR netnd roads lead to Kherdessa, and Kirovograd.	1935 1,163,106	No port area for exclusive naval use. There are some naval barracks, a naval aviation school, model-testing basin, and Admiralty offices.	The chief naval shipbuilding yards of the Black Sea area and the only one in the area capable of building capital ships. Two other yards built and repaired naval and commercial vessels.
. clearance. Highways land and along coast.	No data.	None.	Small-craft repairs only.
e to USSR network. lead inland and along	1935 561,034	No data available on any naval establishment.	Small port-owned shops for repairs to moderate-sized vessels.
to USSR network. Two al low-type roads lead	1936 23,875	None.	About 7 miles S of the harbor is a small yard for repair of commercial vessels and building of small craft.
e connects into USSR k. Three third-rate lead from town.	1934 126,800	None.	Small-craft repairs.
nnections with two -track lines. All-weathds lead along coast but type roads lead to N.	No data.	None.	A small yard for small-craft and above-water repairs to larger vessels. A larger yard reported under construction.

NAME AND LOCATION		ANCHORAGE	ENTRANCE	H
WEST COAST, PRINCIPAL PORTS (Continued):				
Tallinn, Estonia	59°26'N, 24°45'E	North of Old Harbor and in Teliskopli Laht in 6 to 16 fms. over mud. Small craft in 5 fms. or less near New Harbor.	Through Tallinna Laht (bight) and Reid (road) natural depths of 10 to 40 fms. Adjacent to Old Harbor and shipyards depths are 5.5' or more, and at least 4 fms. at New Harbor.	Two bas bor 15'
Rīga, Latvia	56°57'N, 24°06'E	In roadstead 2 miles northwest of entrance moles in 10 to 11 fms. over mud, but unsafe during strong northerly winds. Some anchorage in river clear of navigation channel.	The bar of the Daugava extends more than 1 mile seaward from head of entrance moles. The least depth of dredged channel was 27' in 1939. Depth lessens to 20' at uppermost part of harbor.	Comp trit str
Ventspils, Latvia	57°24'N, 21°32'E	In roadstead 2¾ to 4½ miles offshore in 8 to 10 fms. Several third-class anchorages in Outer Harbor.	Dredged channel 110 yards wide with controlling depth of 23', possibly 25'.	Oute wit Co mil 2,0 an Up fro
Liepāja, Latvia	56°31'N, 21°00'E	Roadstead outside harbor is entirely unprotected, 5 to 7 fms.	A 600'-wide, 27'-deep channel leads from the open sea to the middle of three entrances to Outer Harbor. Entrance to Commercial Harbor is 500' wide and 24.5' deep. Entrance to Naval Harbor Canal is 300' wide and about 28' deep.	More ha to of shi str
Klaipėda, Lithuania	55°43'N, 21°07'E	In roadstead in 10 to 13 fms., unsafe when winds are from south through west to north.	Normally 820' wide and 23' deep but reported in 1945 as suited for vessels drawing no more than 16'. Entrances to New Basin are 21.5' and 23' deep, 150' and 100' wide.	Com no Ha (l m
Kaliningrad	54°42'N, 20°29'E	Vessels can moor along the Pregel' channel, but no free-swinging anchorage is available.	Königsberg Ship Canal, about 20 miles long, least bottom width of 156', and a least depth of 26'.	Com tw ex
Baltiysk	54°38'N, 19°54'E	Open anchorage in 10 fms. in roadstead and mooring in entrance channel in about 30' over hard sand.	Seaward entrance to Outer Harbor is 360' wide and 30' deep. Connection from SE end of Outer Harbor with Königsberg Ship Canal is 450' wide and 28' deep. Approach channel is 1,200 yards long, 328 yards wide, with a least depth of 33'. Entrance for Frisches Haff is from 400 to 475 yards wide with a center least depth of 30'.	Out to lo Re to ab Se ha
WEST COAST, SECONDARY PORTS:				
Oranïyenbaum	59°55'N, 29°47'E	In Nevskaya Guba for medium-draft vessels with best shelter in 13' to 18'. Strong easterly winds cause a heavy sea.	A dredged channel leads across the shoal fronting the harbor to 500'-wide entrance between breakwaters.	Abo de ha
Vyborg	60°43'N, 28°46'E	About 3 miles below Uuras in 7 to 10 fms. and above Uuras in 4 to 7 fms. None in harbor.	Tortuous among islands with the 10 miles from Reyd Uuras decreasing from 30' to 20' at Vyborg.	Two w ac
Uuras	60°38'N, 28°34'E	Same as Vyborg.	Same approach as Vyborg. Entrance between the breakwaters is about 110 yards wide and 24' deep.	The de de de R se
Makslakhden Satama (Port for Rëmpeti)	60°27'N, 28°43'E	Shallow-draft anchorage in harbor but the bay Makslakhti has depths from 16' to 33'. Channel fairway passes through the bay anchorage.	A 24'-deep channel leads from the roadstead, Reyd Uuras, into S end of harbor. A 7.5'-deep channel leads to N end.	Bet R S 1(2(cl
Koyvisto	60°22 N, 28°38'E	In 7 to 10 fms. adjacent to Zaliv Koyvisto. Other nearby berths among shoaled spots.	Marked 30' deep channels lead 7 miles from Gulf of Finland and 10 miles from Vyborgskiy Zaliv.	A P a fi

OCATION	ANCHORAGE	ENTRANCE	HARBOR WATER AREA	LINI
L PORTS (Continued):				
59°26'N, 24°45'E	North of Old Harbor and in Teliskopli Laht in 6 to 16 fms. over mud. Small craft in 5 fms. or less near New Harbor.	Through Tallinna Laht (bight) and Reid (road) natural depths of 10 to 40 fms. Adjacent to Old Harbor and shipyards depths are 5.5' or more, and at least 4 fms. at New Harbor.	Two artificial harbors, a fishing basin, and two shipyard harbors, with depths ranging from 15' to 33'.	9,140
56°57'N, 24°06'E	In roadstead 2 miles northwest of entrance moles in 10 to 11 fms. over mud, but unsafe during strong northerly winds. Some anchorage in river clear of navigation channel.	The bar of the Daugava extends more than 1 mile seaward from head of entrance moles. The least depth of dredged channel was 27' in 1939. Depth lessens to 20' at uppermost part of harbor.	Comprised of the Daugava and tributaries for 23 miles upstream, about 8,900 acres.	4,180
57°24'N, 21°32'E	In roadstead 2¾ to 4½ miles offshore in 8 to 10 fms. Several third-class anchorages in Outer Harbor.	Dredged channel 110 yards wide with controlling depth of 23', possibly 25'.	Outer Harbor about 300 acres with half about 13' to 27' deep. Commercial Harbor is about 8 miles of the Venta. The lower 2,000 yards is about 25.5' deep and about 600' to 800' wide. Upper part gradually decreases from 21' to 16' and less.	2,800
56°31'N, 21°00'E	Roadstead outside harbor is entirely unprotected, 5 to 7 fms.	A 600'-wide, 27'-deep channel leads from the open sea to the middle of three entrances to Outer Harbor. Entrance to Commercial Harbor is 500' wide and 24.5' deep. Entrance to Naval Harbor Canal is 300' wide and about 28' deep.	More than 600 acres in several harbors with depths from 18' to 32'. In 1917 a German force of 25 transports and supply ships. 6 cruisers, and 50 destroyers assembled here.	...
55°43'N, 21°07'E	In roadstead in 10 to 13 fms., unsafe when winds are from south through west to north.	Normally 820' wide and 23' deep but reported in 1945 as suited for vessels drawing no more than 16'. Entrances to New Basin are 21.5' and 23' deep, 150' and 100' wide.	Comprised of entrance and northern part of Kurisches Haff, 6¼ miles, and the Dange (lower part of the river Akmena).	2,540
54°42'N, 20°29'E	Vessels can moor along the Pregel' channel, but no free-swinging anchorage is available.	Königsberg Ship Canal, about 20 miles long, least bottom width of 156', and a least depth of 26'.	Comprised of the Pregel' and its two branches and three basins excavated from the left bank.	5,850 (Additi Kran Grün
54°38'N, 19°54'E	Open anchorage in 10 fms. in roadstead and mooring in entrance channel in about 30' over hard sand.	Seaward entrance to Outer Harbor is 360' wide and 30' deep. Connection from SE end of Outer Harbor with Königsberg Ship Canal is 450' wide and 28' deep. Approach channel is 1,200 yards long, 328 yards wide, with a least depth of 33'. Entrance for Frisches Haff is from 400 to 475 yards wide with a center least depth of 30'.	Outer Harbor about 80 acres, 28' to 30'. Inner Harbor 700 yards long, about 12 acres, 21' deep. Rear Harbor about 60 acres, 19' to 21' deep. Naval Harbor, about 15 acres in 23' to 33'. Several smaller and shallower harbors.	5,930
RY PORTS:				
59°55'N, 29°47'E	In Nevskaya Guba for medium-draft vessels with best shelter in 13' to 18'. Strong easterly winds cause a heavy sea.	A dredged channel leads across the shoal fronting the harbor to 500'-wide entrance between breakwaters.	About 50 acres with 20' to 25' depths and a 11½'-deep boat harbor of about 4 acres.	...
60°43'N, 28°46'E	About 3 miles below Uuras in 7 to 10 fms. and above Uuras in 4 to 7 fms. None in harbor.	Tortuous among islands with the 10 miles from Reyd Uuras decreasing from 30' to 20' at Vyborg.	Two harbors, North and South, with a total area of about 50 acres with 10' to 24' depths.	...
60°38'N, 28°34'E	Same as Vyborg.	Same approach as Vyborg. Entrance between the breakwaters is about 110 yards wide and 24' deep.	The larger portion has general depths of 10' to 17' with a 24'-deep channel. A 24' to 36' deeper part is between Ostrov Ravansaari and Ostrov Uuransaari.	1,980
60°27'N, 28°43'E	Shallow-draft anchorage in harbor but the bay Makslakhti has depths from 16' to 33'. Channel fairway passes through the bay anchorage.	A 24'-deep channel leads from the roadstead, Reyd Uuras, into S end of harbor. A 7.5'-deep channel leads to N end.	Between off-lying islands, Ostrov Revonsari and Ostrov Villin-Sari general depths are 12' to 16' with central part of 20' to 26'. A maintained 24'-deep channel is in center.	...
60°22 N, 28°38'E	In 7 to 10 fms. adjacent to Zaliv Kowisto. Other nearby berths among shoaled spots.	Marked 30' deep channels lead 7 miles from Gulf of Finland and 10 miles from Vyborgskiy Zaliv.	A recession of the shoreline of Proliv Koivisto Salmi with about 200 acres in 7 to 10 fms. free of hidden dangers.	610

TABLE I - 1 (Continued)

LINEAR FEET OF WHARFAGE IN VARIOUS DEPTHS						RANGE OF WATER LEVEL	ICE CONDITIONS	INLAND CI
140	2,785	8,315	560	...	20,800	Lunar tides are negligible. A range of about 4′ is caused by winds.	Ice breakers maintain open channels except from mid-January to end of February.	5′0″-gage connec net. A 759-cn leads from p weather roads.
180	12,535	7,375	7,685	...	31,775	Rise varies from 2′ to 3′ and fall from 1′ to 1.5′. Spring thaws may cause rise of as much as 10′ and a westerly wind may raise the level as much as 5′.	Ice breakers can keep open navigation although port is usually icebound from 4 to 10 weeks between December and mid-April.	There was dua (4′8½″ and 5′0 only broad Railroads and radiate from R
300	8,500	...	...	...	11,300	Normal variation is from 1′ above to 1′ below. Ice thaw increases depth by 4′ to 5′ or more.	Normally ice-free during entire year. Ice breakers required in severe winters.	R.R. lines of 5′0″ connect this p ports and inla inland.
..	1,080	19,580	4,205	...	25,130	Nontidal with normal variation from 3′ above to 2′ below mean water level.	Normally sufficiently ice-free to be usable all winter. Ice breakers available for thin ice which forms between December and March.	R.R. lines of 5′0″ g Highway clear grade roads.
340	2,850	1,800	950	...	8,140	Frequently varies as much as 1′ above or below mean level, occasionally as much as 2′.	Lower part frozen over several months of each year, upper part only few days. In severe winters ice breakers clear channel.	Two rail lines cor broad-gage ne sonal roads lea way net.
350	6,700	23,600	2,800	1,800	40,750	In middle of bay range is from 4′ above to 3′ below mean level; in the Pregel′, 6′ above to 4′ below mean level.	Closed on an average of 11.6 days per year. Maximum period was 91 days.	Good R.R. clear sides of the r road connectio work.
(ditional wharfage on the Novyy Pregel′ above ramer bridge and on the Staryy Pregel′ above rüne bridge, but details are unknown.)								
30	4,705	5,480	1,385	...	17,500	No tidal influence. Water rise to 3′ above and fall to 3.25′ below mean level.	Port is closed on an average of less than a day each year but Baltic Sea fixed ice frequently bars the port. Formation is between 5 December and 17 March.	Single-track R.R. Kaliningrad, a highway.
..	...	8,250	...	...	8,250	Lunar tides insignificant. Flood waters may cause rise of 4′ and westerly winds 10′ to 12′.	Similar to Leningrad. Ice breakers keep channel open when possible.	Steam R.R. line t trified line t Highway to Leni other roads are
(About 800′ not considered usable.)								
.	5,670	...	9,355	...	15,025	No tides: level is affected mainly by wind.	May close between December and May. Ice breakers usually keep harbor open.	R.R. connection and USSR lines lead in three d terminus of Saim menskiy Kanal).
10	590	920	3,350	...	6,840	Similar to Vyborg.	Similar to Vyborg.	Rail and highway both Finland an Saima Canal at vides waterway t land.
.	...	...	3,420	...	3,420	Similar to Vyborg.	Similar to Vyborg.	Similar to Uuras.
0	550	2,135	1,710	...	5,005	Similar to Vyborg.	Similar to Vyborg.	Rail and highway similar to Uuras.

ND CLEARANCE	YEAR AND MAXIMUM KNOWN VOLUME OF TRADE THROUGH PORT	NAVAL ESTABLISHMENTS	BUILDING OR REPAIR FACILITY
connections with USSR 759-cm. gage line also rom port. Good all-roads.	1937 Imports 410,013 Exports 391,322 Total 801,335	Was main base of the Estonian Fleet. Served as Soviet naval base (1939-1941). Used by German Navy. Present use not known, but it is the headquarters of a naval district.	Several yards for repair. Shipbuilding activities suspended several years ago but may now be resumed.
s dual-gage trackage nd 5'0") but probably road gage remains. ls and good highways from Riga.	1937 Imports 1,126,426 Exports 1,480,363 Total 2,606,789	No naval significance known.	Three small yards.
of 5'0" and 60-cm. gage this port with other id inland. Roads lead	1937 353,937	Torpedo boats were stationed here in 1940.	Small repairs to hull and machinery. No dry docks reported.
of 5'0" and 75-cm. gage. clearance is via low-ads.	1937 Imports 144,797 Exports 164,998 Total 309,795	A naval base since Czarist days. Naval portion designed as an advance base for the Soviet Baltic Fleet. Probably next to Tallinn in importance.	Naval ship repair and building yards. Two graving docks about 600' long, 85' long at mean high water level.
nes connect into USSR age net. Only 2 sea-ads lead into the high-.	1937 Imports 1,221,822 Exports 695,736 Total 1,917,558	German base for U-boats and destroyers. No data on use by USSR since capture in January 1945.	Minor repairs to hull and machinery. The one yard reported converted to a naval repair base by the Germans in 1939.
. clearance from both the river. Excellent nnection to the net-	1936 Coastwise 3,400,000 Foreign 1,656,000 Total 5,056,000	There is a small naval basin but Soviet use is unknown.	The Schichau yards have been expanded and in 1944 were reported to have 20 berths for submarine repairs. Two other small facilities.
ck R.R. connects with grad, as does a good .	1937 36,266 (Mostly coastwise trade)	A U-boat training and operational base during the war. Soviet use is unknown. Considered a defense installation for Kaliningrad. Expansion of naval harbor was in progress.	Only small yards for repair of small ships.
. line to W and elec-line to Leningrad. to Leningrad is good; ads are lower type.	No data.	Minelayers, minesweepers, and motor torpedo boats based here.	No major repair facilities.
nection with Finland SR lines. Main roads three directions. Sea s of Saima Canal (Say-Kanal).	No data.	No data but believed a naval air station.	Two shipyards in North Harbor for repair and construction of small craft.
highway connections to land and USSR. The Canal at Vyborg pro-terway to interior Fin-	No data.	No data.	A war-damaged small yard on Ostrov Ravansaari.
Uuras.	No data.	No data.	No data.
highway connections to Uuras.	No data.	No data.	None.

NAME AND LOCATION		ANCHORAGE	ENTRANCE	H
NORTH COAST, PRINCIPAL PORTS:				
Arkhangel'sk	64°28'N, 40°32'E	Off city in roadstead 30' to 68'. Numerous in approaches to city. Temporary in bay outside the bar.	A 350' fairway, 23.5' at H. W., crosses the bar. The channels inside are upward from 600' wide and generally 24' deep; 26 miles to the city.	Exter trib dep
Murmansk	68°58'N, 33°03'E	Kol'skiy Zaliv for vessels of any size, 100 vessels simultaneously anchored in 1944. Good in harbor area off Rosta.	Through Kol'skiy Zaliv about 26 miles, 2 miles wide, 100 fms. deep.	Abou wid 20 f
NORTH COAST, SECONDARY PORTS:				
Molotovsk	64°35'N, 39°47'E	Protected for about 5 vessels in 30' over good holding ground.	Dredged channel, 5 miles long, 180' wide, 27' to 30' deep. Constant dredging required.	Abou
Onega	63°55'N, 38°04'E	Seaward from river mouth. Usual is 2 miles E of Shogly Ostrova in 21' to 23'. Depths of 12' to 36' between mainland and island.	Karel'skiy Farvater maintained by dredging, 14.5' at low water neaps (1937).	Abou abr
Belomorsk	64°32'N, 34°48'E	Extensive roadstead exposed to NE winds, 20' to 36'. Small craft only in harbor.	Dredged channel 2 miles long, 300' wide, 15.5' deep (1936) leads to head of harbor.	Irregu and dee insi
Kem' (Port is Rabocheostrovsk,	64°57'N, 34°37'E 64°59'N, 34°47'E)	Outside, just N of Ostrov Yak, and off the port.	Between Ostrov Yak and Ostrov Rabocheostrovsk, less than 600' wide in places, least charted depth of 24'.	Abou 2,6(
Kandalaksha	67°08'N, 32°25'E	Off the town in 15 to 38 fms. Small vessels between 6- and 10-fm. contours, 1,200' offshore.	Fairway close to NE shore has a clear width from 1.2 to 4 miles and depths from 5 to 38 fms.	3.5 m 7 t
Iokan'ga Naval Base	68°04'N, 39°30'E	A mile-long section of roadstead west of Ostrov Vitte in 6 to 12 fms. over mud and sand. More exposed off Ostrov Sal'nyy in 10 to 16 fms.	Main entrance between Ostrov Sal'nyy and Ostrov Medvezhly, about ½ mile wide between 10-fm. contours.	Abou yar in
Vayenga Naval Base	69°05'N, 33°27'E	In 18 fms. with Mys Karbas bearing 352° and Mys Alysh, 249°. Six 1st-class anchorages, of which 3 are at mooring buoys.	Free and clear with depths of 18 to 38 fms.	A mi wit are but
Polyarnyy Naval Base	69°12'N, 33°28'E	SE of harbor, off naval base in 20 to 24 fms., poor holding ground.	N entrance 1,000' wide, 30 to 40 fms. deep.	Abou 2,0(
WEST COAST, PRINCIPAL PORTS:				
Leningrad	59°56'N, 30°18'E	No free-swinging berths in port. About 44 ships can be moored to buoys in depths of 22' to 28'. Near Kronshtadt in Nevskaya Guba third-class berths are available but exposed to strong easterly winds.	A dredged channel, 13.5 miles long through Nevskaya Guba from Kronshtadt to Lower Harbor of Leningrad had a minimum bottom width of 350' and a dredged depth of 31' (1928) in the open section. The protected section was 280' wide. It was reported in 1945 that limiting draft was 23' for vessels entering the harbor.	The low abo wit in Shi al) thr Ne dee
Kronshtadt	59°59'N, 29°46'E	In Malyy Reyd opposite Central Harbor in 28' over mud, exposed to southeasterly winds. Fair-weather anchorage in Bol'shoy Reyd in 13 to 16 fms. A few mooring buoys in harbor.	Several entrances through protecting mole but south channel (Yuzhnyy Kronstadtskiy Farvater) is the only one permitted merchant vessels. It has a 30-foot project depth and leads about 6.5 miles through Bol'shoy Reyd.	Abou an of Ha lie otl 17' car

TABLE I - 1

SUMMARY OF PRINCIPAL AND SECONDARY PORTS, EUROPEAN USSR

HARBOR WATER AREA	LINEAR FEET OF WHARFAGE IN VARIOUS DEPTHS						RANGE OF WATER LEVEL	ICE CO
	25'+	*20'–25'*	*12'–20'*	*0'–12'*	*Unknown*	*Total*		
Extensive in several channel distributaries; various widths and depths.	6,100	39,635	9,290	2,580	...	57,605	At bar: H.W. springs 3.6', neaps 3.0'. At city: H.W. springs 3.0', neaps 2.5'. MSL at city 1.9'.	Normally close May. Bakari winter of 194
About 3 miles long, ½ to 1 mile wide, mid-channel depths 10 to 20 fms.	1,000	10,960	4,375	1,245	740	18,320	Mean H.W. springs 12.0', neaps 9.75'.	Virtually ice-fr quired occasi
About 250 acres, 28' to 30' deep.	2,240	...	...	...	1,600	3,840	Mean H.W. springs 3.0', neaps 2.5'; mean water level 1.5'.	Similar to Arkl
About ¾ mile wide, 19' deep abreast town.	...	...	1,000	2,390	200	3,590	Mean H.W. springs 5.5', neaps 4.5'; mean water level 2.75'.	Closed from ea mid-May.
Irregular, shallow with shoals and rocks. From 25' to 30' deep at entrance to 15' to 20' inside.	...	1,450	1,450+	...	...	2,900+	Mean H.W. springs 4.75', neaps 4.0'; mean water level 2.5'.	Closed from mi May.
About 1.5 miles long, 1,000' to 2,600' wide, 18' to 26' deep.	1,390	...	2,690	...	1,270	5,350	Mean H.W. springs 6.0', neaps 5.0'; mean water level 3.5'.	Closed from ea mid-May.
.5 miles long, ½ to 1 mile wide, 7 to 38 fms. deep.	...	...	820	100	. .	920	H.W. springs 7.25', neaps 6.0'.	Closed from ea end of May.
About 4 miles long, 500 to 2,200 yards wide, 10 to 18 fms. deep in central part.	750	...	750	...	...	1.500	H.W. springs 18.75', neaps 15.25'; mean water level 11.0'.	Ice up to 6" thi ters. Never tion.
1 mile-long indentation of coast with shoaled margins. Depths are 18 to 38 fms. at entrance but only 3 fms. at head.	...	...	2,190	...	380+	2,570	Mean H.W. springs 12.0', neaps 9.75'; mean level 7.0'.	Only shallow v strong winds cluding wint
About 1.5 miles long by 1,000' to 2,000' wide, 6 to 24 fms. deep.	470	2,570	...	1,090	...	4,130	Mean H.W. springs 12.0', neaps 9.75'; mean level 7.0'.	Usually free ur may form bu interfere wit
The port (Morskoy Kanal and lower part of the Neva) has about 12,000 acres of water with about 8 miles of quayage in depths from 18' to 28'. The Ship Channel (Morskoy Kanal) extends for about 2 miles through Lower Harbor to the Neva and is about 31' to 32' deep and 135 yards wide.	13,910	15,780	3,070	4,050	2,100	38,910	Nontidal average range is from 3.0' above to 1.5' below mean water level. Maximum rise 7.0' above; greatest fall, 3.0' below mean level.	Closed to navig weeks, 22 Jar number of ic the navigati age thickness never more t
About 300 acres in four harbors and a smaller basin. Depths of the 47-acre Coastal Trade Harbor are not known but believed more than 13'. The other three harbors are from 17' to 28'. Several miles of canals provide lighter quayage.	6,315	1,800	8,955	5,600	2,640	25,310	Lunar tides are negligible. Range caused by winds is from 3' above to 2' below mean level.	Normally icel vember to A extend navi vere winters are not poss through Mar
(Note: about 5,100' with 25' or more depth is on breakwater mole without any shore connection.)								

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PRINCI

USSR

ICE CONDITIONS	INLAND CLEARANCE	YEAR AND MAXIMUM KNOWN VOLUME OF TRADE THROUGH PORT	NAVAL ESTABLISHMENTS
		Short tons	
Normally closed December to May. Bakaritsa kept open winter of 1943-1944.	R.R. to Vologda and net from station on left bank; spur to Molotovsk. Poor local roads.	1936 2,222,121 (Mostly export; includes minor imports through Molotovsk.)	Main operating and repair ba for White Sea Flotilla, re base of Northern Fleet.
Virtually ice-free, breakers required occasionally.	R.R. to Leningrad; spur connection with Polyarnyy. Roads are poor.	1937 951,613	Principal Arctic naval ba. The Northern Fleet "Service the Rear" administrative hea quarters is at Murmansk wi operations facilities at contig ous Rosta.
Similar to Arkhangel'sk.	R.R. to Arkhangel'sk. Poor plank roads in immediate area; no highway inland.	No exports; small imports included in Arkhangel'sk total.	New port. Not a naval base b will do building and repair include battleships.
Closed from early November to mid-May.	On branch of Murmansk - Leningrad R.R. between Belomorsk and Obozerskaya on Arkhangel'sk - Vologda line.	1935 289,865	None.
Closed from mid-October to mid-May.	On branch of Murmansk - Leningrad line from Belomorsk through Onega to Obozerskaya on Arkhangel'sk - Vologda line. N end of Stalin White Sea - Baltic Canal. Poor-grade road to Kem' and Kandalaksha.	1937 75,202	Minor naval activities.
Closed from early December to mid-May.	On Murmansk - Leningrad line. Road to Belomorsk and Kandalaksha.	1937 65,927	None.
Closed from early November to end of May.	On Murmansk - Leningrad line; branch from a few miles S leads to Finland. Low-grade road follows branch and main line to Krem'.	No data, small volume.	None.
Ice up to 6" thick in severe winters. Never closed to navigation.	Poor local roads.	No commercial significance. Only small fishing village prior to World War II.	An advance base for anti-su marine and mine-sweeping o erations.
Only shallow waters freeze, but strong winds break up ice, precluding wintering in harbor.	15-mile extension of Murmansk - Leningrad line reported. Local roads and to Murmansk.	No commercial significance.	Chief operating base of t Northern Fleet. Developme continuing.
Usually free until February. Ice may form but insufficiently to interfere with navigation.	An extension of Murmansk - Leningrad line. Poor local roads.	No commercial significance.	Hq. of Commander-in-Chief the Northern Fleet. Operati base for submarines and c stroyers.
Closed to navigation for about 15 weeks, 22 January to 5 May. A number of ice breakers extend the navigation season. Average thickness of ice is 2.3' and never more than 3.3'.	Rail and highway connections into USSR network.	1934 Imports 374,054 Exports 4,320,986 Total 4,695,040 (About 33.1% of imports and 22.6% of exports through European USSR ports.)	Not a naval base but berths a available and used by na vessels. Naval academy her
Normally icebound from November to April. Ice breakers extend navigation, but in severe winters vessel movements are not possible from January through March.	None except local on the island. During winter when Nevskaya Guba is frozen vehicles cross the ice to Leningrad.	No data available; primarily naval supplies.	Chief naval operating base f the Baltic Fleet. Capital shi were berthed here. Vario naval installations.

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TABLE I - 1
PRINCIPAL AND SECONDARY PORTS
JANIS 40
CONFIDENTIAL

LAND CLEARANCE	YEAR AND MAXIMUM KNOWN VOLUME OF TRADE THROUGH PORT	NAVAL ESTABLISHMENTS	BUILDING OR REPAIR FACILITY
	Short tons		
Vologda and net from n on left bank; spur to ovsk. Poor local roads.	1936 2,222,121 (Mostly export; includes minor imports through Molotovsk.)	Main operating and repair base for White Sea Flotilla, rear base of Northern Fleet.	Naval and commercial yards.
Leningrad; spur connec- with Polyarnyy. Roads or.	1937 951,613	Principal Arctic naval base. The Northern Fleet "Service of the Rear" administrative headquarters is at Murmansk with operations facilities at contiguous Rosta.	Commercial and the major repair base for Northern Fleet.
rkhangel'sk. Poor plank in immediate area; no ay inland.	No exports; small imports included in Arkhangel'sk total.	New port. Not a naval base but will do building and repair to include battleships.	Proposed development to largest building yards in USSR.
ch of Murmansk - Len- R.R. between Belomorsk Obozerskaya on Ark- 'sk - Vologda line.	1935 289,865	None.	None.
h of Murmansk - Lenin- line from Belomorsk h Onega to Obozerskaya hangel'sk - Vologda line. of Stalin White Sea - Canal. Poor-grade road ' and Kandalaksha.	1937 75,202	Minor naval activities.	Small machine repairs at saw-mill shops.
mansk - Leningrad line. o Belomorsk and Kan- ha.	1937 65,927	None.	For small craft only.
nansk - Leningrad line; from a few miles S to Finland. Low-grade llows branch and main Krem'.	No data, small volume.	None.	Minor repairs.
l roads.	No commercial significance. Only small fishing village prior to World War II.	An advance base for anti-submarine and mine-sweeping operations.	Small shop facilities. Dry dock 500' long by 45' wide.
xtension of Murmansk - rad line reported. Local nd to Murmansk.	No commercial significance.	Chief operating base of the Northern Fleet. Development continuing.	Some repair facilities for naval vessels. A 1,200-ton floating dry dock was largest available.
nsion of Murmansk - rad line. Poor local	No commercial significance.	Hq. of Commander-in-Chief of the Northern Fleet. Operating base for submarines and destroyers.	Machinery and above-water hull repairs. Repair ship moored here.
l highway connections SSR network.	1934 Imports 374,054 Exports 4,320,986 Total 4,695,040 (About 33.1% of imports and 22.6% of exports through European USSR ports.)	Not a naval base but berths are available and used by naval vessels. Naval academy here.	Commercial and the chief naval shipbuilding yards of the Baltic Fleet are located here. Two yards can build battleships. Arming of ships is carried on here.
ept local on the island. winter when Nevskaya is frozen vehicles cross to Leningrad.	No data available; primarily naval supplies.	Chief naval operating base for the Baltic Fleet. Capital ships were berthed here. Various naval installations.	Considerable repair facilities including dry docks for battleships, but lack of large cranes limits scope of activities.

FIGURE I-10
PORTS AND LANDINGS, EUROPEAN USSR
JANIS 40

TABLE I - 2

MINOR PORTS AND LANDINGS

European USSR

Name and Coordinates	Anchorage Description	Entrance		Harbor Depth	Landing Facilities		Clearance Facilities		Remarks
		Least width	Least depth		Number and description	Depth alongside	Rail	Road	
			Feet	*Feet*		*Feet*			
North Coast:									
Amderma, Kara Sea (Karskoye More) (69°46′N, 61°40′E)	Partly sheltered anchorage	2 mi.	No data	No data	1 pier, with pierhead 100′ by 60′, approach 325′ by 35′	No data	Good	None	Terminus of R.R. from Kotlas. Port for local fluorspar mines. Lighters based within river 800′ W of pier. Closed in winter.
Khabarovo, Barents Sea (69°40′N, 60°25′E)	Unsheltered, in 36′	1 mi.	39	39	1 offshore wharf 110′ by 30′, 2 approaches	About 8	None	None	Pier is 6.3 mi. SW of wharf at Khabarovo, a lumber shipping point. Road connects 2 wharves. 3 sheds each 150′ by 25′, 1 shed 125′ by 25′. Closed in winter.
					1 pier, 175′ by 20′	No data	do.	do.	
Guba Varneka (bay), Ostrov Vaygach (island) (69°42′N, 60°03′E)	Sheltered, in 29′, has twenty 3d-class berths in E bight	1,500 yds.	36	36 to 21	1 pier, pierhead 60′ by 20′, at Posselok, on NE side of E bight	About 6	do.	do.	Located at W entrance to Proliv Yugorskiy (strait), on Arctic Sea Route. Future expansion planned. Closed in winter.
					2 piers on SW side of E bight	About 6	do.	do.	
Guba Belush'ya (bay), Novaya Zemlya (71°32′N, 52°19′E)	Sheltered, in 50′ to 60′, good holding, with 1st class berths	1.6 mi.	78	78 to 30	1 timber offshore wharf, 200′ by 20′, with 2 approaches 20′ wide	16	do.	Short	Fine natural harbor. No cranes. Trucks go on wharf. 5 small sheds. Several lighters and launches. 8 large oil tanks. Seaplane base in bay. Closed in winter.
Nar'yan-Mar (Pechora) (67°39′N, 53°02′E)	Unsheltered in 20′ to 23′, within bay at river entrance, over mud and sand	700 yds.	10 to 12 over bar, l. l. w. (Report deepened, not confirmed)	29 to 14, l. l. w.	1 quay 950′ long 1 quay 1,400′ long 1 quay 880′ long	24 (Est.) 20 (Est.) 14 (Est.)	R.R. to Kotlas proposed, possibly built	No data	Located about 65 stat. mi. up river. Tidal range about 2.5′. Port has large coal depot, marine repair yard with floating dry dock 300′ by 60′, warehouses, lighters, 2 automatic cranes, 6 steam cranes, 1 floating 50-ton crane, 1 conveyor. Oil depot under construction (1942). Coal and lumber chief trade. Closed in winter.
Unskaya Guba (inlet), White Sea (Beloye More) (64°47′N, 38°25′E)	Unsheltered, in 36′ to 42′, over mud and sand	800′	10 over bar, l. l. w. (1934)	42 to 24, l. l. w.	1 pier, 700′ by 140′	13, l. l. w.	None	No data	Tidal rise 4.0′ to 4.5′ above l. l. w. Closed in winter.
Solovetskiy, White Sea (65°01′N, 35°42′E)	Sheltered, in 36′ to 114′, mud over rock, in bay off inner harbor	300′	14, l. l. w.	18 to 7, l. l. w.	1 masonry quay 500′ long 4 small wharves	14, l. l. w. Shallow	None	None	Small natural inner harbor for vessels up to 12-ft. draft. Repair yard with graving dock 171′ by 110′, entrance 27.7′ wide, 12.5′ max. depth on sill. 3 storage sheds. Closed in winter.
Guba Pon'gama (bay), White Sea (65°21′N, 34°25′E)	Sheltered, in 30′ to 48′, with 1st class berths	3,000 yds.	37, l. l. w.	48 to 30, l. l. w.	1 pier	15	None	No data	Best anchorage on W shore of White Sea. Pier in inlet at head of bay. Closed in winter.
Keret', White Sea (66°17′N, 33°33′E)	Sheltered in 36′ to 90′, good holding, with 1st class berths	800 yds.	54	150 to 36	1 pier	18	None	None	Lumber-shipping port, closed in winter.
Guba Kovda (bay), White Sea (66°41′N, 32°52′E)	Sheltered in 36′ to 72′, good holding, with 1st class berths	500 yds.	48 l. l. w.	60 to 36	7,700′ of timber wharves on Ostrov Berezovyy.	18	Narrow gage R.R.	None	Lumber-shipping port, with several sawmills on 3 islands. Minor repairs done at Kovda village. Closed in winter.
					Wharves on Ostrov Ovechiy.	18			
					Wharves on Ostrov Yelovets. (Islands.)	No data			

TABLE I – 2 (Continued)

Name and Coordinates	Anchorage Description	Entrance		Harbor Depth	Landing Facilities		Clearance Facilities		Remarks
		Least width	Least depth		Number and description	Depth alongside	Rail	Road	
			Feet	*Feet*		*Feet*			
North Coast (*Continued*):									
Guba Bol'shaya Por'ya (bay), White Sea (67°05'N, 35°23'E)	Sheltered, in 36′ to 54′, over mud and stones, with 3d class berths	200 yds.	54, l. l. w.	60 to 42	1 marginal wharf, about 1,600′ long	18 to 20, l. l. w	None	Poor	One of 3 deep, narrow inlets grouped together. Lumber-shipping port, serving sawmills. Small marine repair yard, with floating dry dock for 155-ft. vessel. Closed in winter.
Gavrilovo, Barents Sea (69°11'N, 35°51'E)	Unsheltered, in 90′, off small harbor	300′	33	30 to 6	7 piers	No data	None	None	Principal Murman fishing station, with several factories. Closed in winter.
Teriberka, Barents Sea (69°10'N, 35°08'E)	Sheltered, in depths up to 120′ close to shore, four 3d-class berths	1,000 yds. (Inner bay)	236	236 to 30	12 small piers	About 3, l. l. w.	See "Remarks"	None	Fishing station and military outpost. Small airfield nearby. Proposed terminus of R.R. from Murmansk. Several sheds. Tide range 13′. Closed in winter.
Port-Vladimir, Barents Sea (69°25'N, 33°08'E)	Sheltered, in 66′ to 60′, with one 3d-class berth	600′	66	66 to 30	1 quay 700′ long 1 quay 525′ long 5 small piers	Shallow do. do.	None	None	Fishing station on Ostrov Shalim (island) Guba Ura (bay). Open in winter.
Bukhta Ozerko (bay), Barents Sea (69°44'N, 32°08'E)	Sheltered, in 72′ to 30′ over mud, with fifteen 3d-class berths	275′	13	72 to 15	2 piers 200′ by 18′ with floats at outer ends	About 15 (at float)	None	No data	Channel must be buoyed for entry of vessels of over 10′ draft.
West Coast:									
Vilayoki, Vyborgskiy Zaliv (Gulf of Viipuri) (60°37'N, 28°19'E)	Sheltered, in 36′ to 30′, with four 2d-class berths	500 yds.	25	60 to 30	1 quay	17	No data	Poor	Local road from NE side of bay connects to main highway. Closed in winter.
Repola, Vyborgskiy Zaliv (60°40'N, 28°29'E)	Sheltered, off an island, 1 mi. distant SW, in 25′. Three 3d-class berths	300 yds.	25	35 to 16	1 timber offshore wharf, 2 approaches, light railway on wharf face about 500′ long.	About 5	None	Fair	Large sawmill on upland. Closed in winter.
Lis'yenosskaya Gavan', Gulf of Finland (60°00'N, 29°58'E)	Unsheltered, with 3d class berths	Open approach	12	10	270-ft. quay at outer end of mole, served by R.R.	10	Good	Poor	About 11 mi. WNW of Leningrad. Mole is about 500 yds. long, 35′ wide at outer end, with approach thereto 25′ wide.
Ust'ye, Gulf of Finland (59°47'N, 28°45'E)	Sheltered except from N, in 70′ to 36′, with 1st class berths	Open entrance.	90	70 to 18	1 pier about 1,800′ long, with pierhead about 300′ on face. 1 pier about 450′ long	12 8 (at pierhead)	No data	Good	Closed in winter. Kopenskoye Ozero (lake), with seaplane base and naval facilities, entered by canal 6′ deep 0.5 mi. W of main pier at Ust'ye.
Luzhskaya Guba (bay), Gulf of Finland (59°45'N, 28°20'E)	Fair shelter, in 72′ to 30′, with 1st class berths. Open to storms from N	0.5 mi.	72	72 to 30 in bay; 15 to 10 in river	In Luga (river) near mouth: 1 offshore wharf, 335′ by 18′, with 1 approach 1 offshore wharf, 1,050′ by 33′, with 4 approaches 1 offshore wharf, 525′ by 33′, with 1 approach 1 offshore wharf 550′ by 35′, with 3 approaches 1 offshore wharf 200′ by 15′, with 3 approaches On E side, at Ruch'i: Quayage of concrete caissons, solid fill, under construction in 1944. Length over 5,000′	No data do. do. do. do. Believed about 30	Good	Good	Quayage at Ruch'i nearly completed in 1944; built for naval use, with rail connections. Luga (river) accessible to ships up to 270′ long, 16′ draft. Vessels of 14′ draft can berth at wharves. 2 wharves in the Luga, 1,050′ and 525′ long, probably to be combined, with 1,890′ total length. Boat canal connects the Luga with Narva. Ozero Lipovskoye (lake), entered close W of Luzhskaya Guba, reportedly developed as destroyer base, with 28′ entrance depth.

TABLE I – 2 (Continued)

Name and Coordinates	Anchorage Description	Entrance		Harbor Depth	Landing Facilities		Clearance Facilities		Remarks
		Least width	Least depth		Number and description	Depth alongside	Rail	Road	
			Feet	*Feet*		*Feet*			
West Coast (*Continued*):									
Narva, Estonia (59°10′N, 28°13′E)	In roadstead off river mouth 2.5 mi., in 60′	100 yds.	10	30 to 10 in river up to Narva	Quays with 860′ total berthage, at Narva-Jõesuu. 1 crane	No data	R.R. to Narva	Good	Narva 8.0 mi. above Narva-Jõesuu, at river mouth. Sheds at both points. Closed in winter.
					Quayage totaling 1,200′ at Narva	28 to 5			
					2 lighter piers at Gakkova, on on E side of bay 14 mi. N of Narva-Jõesuu	3			
Kunda, Estonia (59°31′N, 26°32′E)	Part sheltered, in 42′ over sand, with 1st class berths	Open entrance	60	48 to 24 in bay; 5 to 2 in inner harbor	1 stone mole 600′ long	5 to 2	Good	Good	Terminus of R.R. branch. Export point for cement, clay mfrs. 4 cranes, 1 warehouse. Closed in winter.
					1 stone mole 400′ long	5 to 2			
Loksa, Estonia (59°35′N, 25°42′E)	In bay, open to NW–NE, in 120′, with 1st class berths	Open entrance	180	180 to 24 in bay; 15 in inner harbor	1 mole with 280′ berth	13	None	Good	Artificial inner harbor, with 1 warehouse, large pottery on shore. Small marine repair plant, marine railway of 300-ton capacity, 105-ft. cradle. Industrial R.R. track to wharf.
					1 mole with 280′ berth	13			
Haapsalu, Estonia (58°58′N, 23°32′E)	Sheltered, in 18′, over mud, with 3d class berths	140′	10	13	1 L-head pier with pierhead 85′ by 20′	14 to 8	Fair	Good	Entrance channel depth believed increased to 13′. Closed in winter.
					6 small piers (1 with R.R. trackage)	5			
Rohukūla, Estonia (58°54′N, 23°25′E)	Sheltered, in 18′ over mud, with 3d class berths	140′	15	18 to 15	Middle mole, 15′ wide, with 800′ berth space, R.R. trackage, 10-ton hand crane.	17	Good	Good	Artificial harbor, has depths of 19′ to 6′. Considerable war damage. Former sub and destroyer base. Closed in winter.
					1 pier, 425′ by 20′	Believed 15			
					S Mole, undamaged section with 580′ berth space, R.R. trackage	No data			
Virtsu, Estonia (58°34′N, 23°30′E)	Fair shelter, in 42′–30′, over mud, with 2d class berths	From N, 1,000′; from S, 1.5 mi.	From N, 15; from S, 36	50 to 20	Mole with about 900′ berth space, R.R. trackage	13 to 10	Good	Good	Wharves on NW side of island connected to mainland by a short causeway. Closed in winter.
					1 pier with 125′ berth space	5			
Ainaži, Latvia (57°52′N, 24°21′E)	Roadstead, in 30′, off harbor 1.8 mi.	600′ (to pier)	10 (to pier)	16 to 6	1 pier 750′ by 75′, with 1 crane and R.R. trackage	8 (at pierhead)	Good	Good	Artificial harbor. Water piped to pier. No bunker supplies or repair facilities. Closed in winter.
Pāvilosta, Latvia (56°53′N, 21°11′E)	Roadstead, off harbor, 1.5 mi. in over 30′	130′ (between jetties)	14 (silts to 5)	13 to 10	Marginal wharf with about 200′ berth space	12	Good	Good	Harbor in river mouth. Timber loading point, open in winter. R.R. connects to Kuldīga - Liepāja line.
Sventoji, Lithuania (56°02′N, 21°05′E)	Unsheltered roadstead, in over 30′ at 0.7 mi. offshore	80 yds.	10 (1939)	10 to 8 (1939)	No data	No data	Good	Good	Originally a small artificial fishing harbor, conversion to port for larger vessels begun 1937. No data available later than 1941. Extensive construction proposed, part known to have been completed.

TABLE I – 2 (Continued)

Name and Coordinates	Anchorage Description	Entrance		Harbor Depth	Landing Facilities		Clearance Facilities		Remarks
		Least width	Least depth		Number and description	Depth alongside	Rail	Road	
			Feet	*Feet*		*Feet*			
South Coast:									
Ochakov, Black Sea (46°37′N, 31°33′E)	Sheltered, in 21 to 29 feet, with 3d class berths	245′	28	28 to 18	1 mole 2,280′ long, 20′ wide 1 pier 330′ by 10′ 1 pier 250′ by 15′ 1 pier 200′ by 25′, with R.R. connection 1 mole 1,150′ long, 20′ wide	10 to 3 6 to 3 8 to 6 3 14 to 3	Fair	Fair	Small coastal port, sub and M. T. B. base. Moles (1 on each side of point) damaged by demolition. Kept open in winter by ice breakers.
Skadovsk, Black Sea (46°06′N, 32°55′E)	Unsheltered, 2 mi. offshore, in 24′ to 30′	100′	16. 5	16 to 13	Timber open-pile wharves, of 1,640′ total length, around basin	20 to 13	Good	Fair	Artificial harbor 575′ by 450′, with grain warehouses and oil tanks, repair shop with marine railway. Sub base, grain-shipping port. Closed in winter.
Khorly, Black Sea (46°04′N, 33°18′E)	Unsheltered, 2 mi. offshore, in 22′	105′	17 (1938)	22 (1938)	1 timber wharf 260′ by 46′ 1 timber wharf 210′ by 46′ 1 timber wharf 295′ by 50′	18 18 15	Good	Fair	Artificial harbor 1,050′ by 700′ with grain warehouses. Small repair shop with marine railway, small stores of coal and oil. Usable in winter.
Yevpatoriya, Black Sea (45°12′N, 33°23′E)	Partially sheltered, 1 mi. offshore, in 30′ to 33′	Open approach	40 to 30	30, shoaling to shore	4 timber piers (destroyed)	10 to 8	Good	Fair	Natural harbor, in bight fronting town. Grain and salt shipping port, using lighters for loading. Had warehouses, believed destroyed. New wharf under construction May 1944. Had oil depot, status not known. Open in winter.
Balaklava, Black Sea (44°30′N, 33°36′E)	Unsheltered, off harbor, in 150′ to 180′	330′	118	118 to 15	Stone quays on 2 sides of inlet, total length about 7,600′	Believed about 10 to 5	None	Good	Harbor is a narrow inlet, used as sub, M. T. B. base, with repair shop and marine railway. Dredging reported in inner part; vessels up to 350′ long, have access. Open in winter.
Mys Kiik-Atlama (cape), Black Sea (44°57′N, 35°24′E)	Partially sheltered, in 18′ to 42′	0.5 mi.	'36	42 to 18	1 pier 600′ long (pierhead 100′ by 75′) 1 pier 250′ by 20′ 3 piers each 100′ by 10′ 1 mole 400′ by 15′	About 18 About 10 About 5 About 10 to 5	None	Fair	Harbor is cove in Dvuyakornaya Bukhta (bay) on N side of cape. Pier dimensions and depths estimated. Open in winter.
Genichesk, Sea of Azov (Azovskoye More) (46°10′N, 34°49′E)	Sheltered roadstead, depths 19′ to 21′ 3.5 mi. off town	130′	13 (1941)	21 to 19	Quays of 900′ total length, with R.R. tracks	10 to 7.5	Good	Fair	Vessels anchor in roadstead and lighter cargo. Grain-shipping point, closed in winter.
Azov, Sea of Azov (47°07′N, 39°25′E)	River moorings, in 12′	250′	12	12	1 quay 1,575′ long 1 wharf	12 12	Good	Fair	Grain-shipping point, lightering to Taganrog.

7. TRANSPORTATION AND TELECOMMUNICATIONS *

The transportation and telecommunications systems of the USSR closely resemble a spider web with Moscow the center, European USSR the closely woven part, and a few tenuous lines to the north and east. In European USSR the mesh is more closely knit to the south and west from Moscow, connecting with the many ports on the Baltic Sea, and the Black Sea – Sea of Azov coasts. European USSR comprises a little less than one-fourth of the area of the country, yet it has about 62% of the railroad route trackage, about 55% of the principal navigable waterways, and an approximated 60 to 70% of the roads. The oil pipe lines in the area are about 30% of the USSR total; they are extensions of lines in the Caucasus producing area, where most of the USSR oil pipe lines are located. Percentile figures on telecommunications are not available, but the density of population, industry, and transportation in European USSR normally would necessitate a similar percent of communications.

The state-owned transportation and telecommunications systems are integral parts of the extremely centralized government operational control of all resources and facilities. This control is centered in Moscow with a minimum of decentralized authority, and European USSR, including the annexed territories, is the keystone of the economic structure which is planned to give the USSR an increased military-economic potential to safeguard the country against "any contingencies".

A. Transportation

Monopolistic government control of transportation has not brought the efficiency of the USSR systems to a point of favorable comparison with either the West European countries or the United States. The transportation facilities of Imperial Russia were sufficient for the low-standard and near-complete autarky, but the destruction and deterioration incidental to World War I and the subsequent internal strife returned transportation to near-primitive inefficiency. Subsequently, all of the technical advancement achieved in other countries was used by the Soviet Government to raise the USSR transportation standards. By the beginning of World War II, USSR transportation had reached a point slightly below the standards of other European countries. The bulk of the development was in European USSR, and particularly in the areas later occupied by the German forces. As a result of World War II from 50 to 75% of the transportation facilities in those areas were damaged or destroyed. Offsetting this loss was the developed know-how. Since the war, repair and reconstruction has progressed rapidly but progress is short of the announced goals.

Serious weaknesses remain and the various modes of transportation will continue imbalanced for the immediate foreseeable future. Although some reports indicate that the strained inland transportation system is keeping up with the industrial and agricultural output, other statistics on individual commodities point to a lag on the part of transportation, resulting in some wastage. The markedly seasonal climatic regime causes congestion of the transportation facilities, especially railroads at harvesttime. Despite increased canneries and refrigeration plants, transportation falls short and there are losses in the fishing and dairy industries. In some years as much as 20% of the timber remains where felled, or along the waterways, for lack of transportation. All of the statistics, however, reflect the fact that railroad transportation bears between 85 and 93% of the freight-turnover burden.

Emphasis has been placed on development of railroads for the movement of commercial freight, and the majority of ton-miles of freight traffic is carried by the railnet. This freight traffic receives primary consideration in the Soviet planning, but the railroads carry a tremendous passenger traffic as well. The 915,718,000 passengers carried by U. S. railroads in the peak year of 1944 is less than the 1,142,000,000 reported carried by railroads of the USSR in 1937. USSR passenger-mile traffic is much less than that of the U. S. The relatively high number of passengers traveling for shorter distances in the USSR results from the almost totally inadequate automotive transportation and highways.

The Soviet Union has no modern highway network for long-distance automotive transport. Hard-surfaced roads are almost exclusively in the area around Moscow, in annexed western territories, and in some industrial centers. The few roads of this type are used generally for local traffic only. Trucks handle more tons of cargo than do other forms of transport, but the relatively short haul relegates highways to a low fourth place in the comparative amount of ton-mile traffic borne.

Inland waterways and coastwise shipping carry much more traffic than is borne over the highways. The waterways bear 70% more than coastwise shipping, but this traffic is primarily timber. In 1946 there were 21.8 million tons (presumed metric) of timber moved on the inland waterways of all USSR; about 80% was rafted and the remainder was carried by barge and boat. Although the European USSR network of inland waterways (which also radiates from Moscow) is extensive, the long seasonal interruptions caused by winter freezing and summer shallowing of some rivers impedes its usage even for slow-moving bulk cargoes which do not require reliable scheduling. Although lumber is the principal cargo on the waterways, it is a greater burden on the railroads. In 1945 only 46% of all industrial wood and 28% of firewood was borne by the inland waterways, with the remainder carried by the already congested railways. Part of this railroad traffic, however, is the 7% of all industrial lumber which is used by the railroads for ties and bridge timbers. The shortening of river haul and the extending of railroad haul has been needed not only for timber but for all forms of carload freight. The Soviet awareness of the condition and the trend toward corrective action is:

AVERAGE MILEAGE FOR A TON OF CARLOAD FREIGHT

Year	Waterways		Railroads	
	All freight	*Timber*	*All freight*	*Timber*
1928	540	344	309	311
1932	332	211	393	344
1937	307	286	426	457
1940	303	224	435	466
1950 (Plan)	331	246	429	405

In addition to the planned increase of distance that cargo will be moved on the inland waterways, an announced Soviet objective is to link all coastal waters with Moscow through improvement of the rivers and canals.

The completion of the Moscow-to-coasts project will raise the relative position of the already important coastwise shipping. A tangible result of the program is the Stalin White Sea – Baltic Canal, completed in 1933 for vessels with 9¾-foot draft. Extensive port damage or de-

* In view of the scheduled early publication of more recent and comprehensive basic intelligence on this subject, Chapter VII material is summarized in Topic 7 and will not appear as a chapter of JANIS 40.

struction on the south and west coasts must be repaired and reconstructed, along with building of new bottoms to replace the many coastwise shipping vessels which were destroyed during World War II, for realization of increased coastwise trade. The annexation of the Baltic States, East Prussia, and parts of Finland has provided the Soviet Government with many additional good ports on the west coast. This relieves Leningrad, "the window in the west", of its tremendous commercial burden as the only principal commercial port on that coast. An outlet to the Black Sea for shipping plying the enclosed Caspian Sea will affect the coastwise shipping picture and particularly petroleum transportation.

Oil pipe lines of the USSR are mostly in the Caucasus, with extensions into the area of European USSR. The war demonstrated the vulnerability of the Caucasian fields; development of other fields probably will affect the location of future pipe-line distribution systems. Another element in the future pipe-line development might well depend on the arrangements with the Balkan countries. Imports from those countries probably will continue for some years and the transportation method might well be new-constructed pipe lines from those areas into European USSR.

Statistics on distribution of USSR freight are inadequate and, like all other statistics emanating from the Soviet Government, are not fully reliable. An approximate distribution in the USSR for 1940 (premised upon the announced planning figures for 1941) is compared with United States freight ton-mile traffic in 1940 in TABLE I-3.

TABLE I - 3

APPROXIMATE DISTRIBUTION OF COMMERCIAL FREIGHT
1940

Transported by	USSR ton-miles	Percent	United States ton-miles	Percent
	Thousands		*Thousands*	
Railroads	295,000,990	83.6	379,161,000	55.3
Trucks	3,468,190	1.8	51,003,000 *	7.4
Waterways	31,637,100	9.0	118,057,100	17.2
Coastwise vessels	17,182,800	4.9	70,618,050 *	10.3
Oil pipe lines	2,430,150 *	0.7	67,270,000	9.8
Total	352,719,230	100.0	686,109,150	100.0

* Estimated.

Notes on trucks: Ton-mileage in USSR probably includes hauls within cities, while the United States figure includes only intercity service. In 1940, USSR had 890,500 trucks, compared with 4,950,500 registered in the United States. The Soviet average haul was only 6.5 miles, while United States average hauls (statistics are incomplete) range from 50 to 430 miles.

A map of the strategic transportation system is shown in FIGURE I-11. A more detailed and comprehensive map is contained in four sheets, PLANS 22 to 25, inclusive.

(1) Railroads

(a) General

1. DEVELOPMENT.—The first railroad in Russia was built from Leningrad a few miles south to Pushkin in 1837, only seven years after the first public passenger-carrying line was constructed in the United States. The almost lethargic development of railroading in Tsarist Russia is sharply contrasted with the rapid progress in the United States. A comparison of route mileage is:

	U.S.	USSR
1860	30,283	3,109
1913	249,803	36,382
1916	254,251 *	39,000 approx.

* Peak of U.S. expansion, 30 June.

During the period of the Revolution and the ensuing civil war all of the now-nationalized railroads (two-thirds formerly owned by the Tsar and one-third by private individuals and industries) deteriorated through neglect of maintenance as well as through actual damage and destruction. The length of route in the USSR was lessened through the loss of the Baltic States and Finland, but the mileage in those territories was regained by subsequent annexation of those territories in 1939-1940. Development to World War II under the Soviet Government is:

	1923	1933	1938	1941
Route trackage, miles	45,893	51,334	52,816	70,215
Freight traffic, millions short tons	74.4	295.6	570.0	...

Between 1921 and 1928 little expansion or improvement took place, but from 1928 to 1941 the Soviet railroads were expanded and improved in four major ways. The total length of route mileage was increased about 47 percent. A program of electrification was inaugurated in 1929, and by 1941 comprised about 2% of the system. In 1929 a USSR commission came to the United States to study signal systems in operation, and in 1931 installation of automatic signals was started in experimental tests. Until 1937 signal expansion was slow and German and Belgian equipment was used. Part of this installation was dismantled and after further improvement expansion became more rapid until 1941 when there were 5,160 miles of railroad equipped with automatic signals. Along with the extension and construction of lines, electrification, and installation of the automatic blocking system, the roadbeds of lines were strengthened and improved.

A substantial part of the 47% increase of the route mileage consisted of acquisitions in the annexed territories, but it is estimated that about 14,000 miles, or 65%, of the total increase was newly constructed by the Soviet Government. During the same 13-year period the amount of double-track lines grew from 9,700 miles to 18,500 miles, and about 65% of the growth was newly constructed by the USSR.

Belated realization of the necessity for double-tracking is indicated by the fact that the USSR had increased the amount of second track by only 792 miles, or about 2%, between 1913 and 1928 to a total of about 9,700 miles in 1928. Between 1928 and 1941 the increase of about 8,800 miles was more than 90 percent. During World War II a large proportion of the double-track lines was damaged or destroyed, and sections of the undamaged portions were crippled by use of the second tracks to replace the destroyed sections of the main-line tracks. At the end of the war only about 75% of the prewar total of double-track line was in existence.

European USSR includes about 41,800 route miles and has had the most complete development, but the trend of economic movement to the east probably will result in extensive development in that direction. Considerable improvement is yet necessary to bring the USSR system to a position generally comparable with that of the United States. In the beginning of 1946, mileage of all tracks owned by all classes of railroads, except switching and terminal companies, totaled about 368,000 miles in the U. S. First main track amounted to 227,000 miles of road compared with the existing 70,215 (1941) and planned 74,100 miles (1950) of USSR. The planned second track and some new electrified lines brings the planned total amount of railroad route track to about 97,000 miles for 1950.

There has been a gradual increase in the mechanical, engineering, operating, and administering efficiency. The USSR needs are more nearly like the U.S. needs than those of any other European country. The trend of USSR development indicates copying of U.S. standards.

2. ADMINISTRATION.—All railroads are Government owned and are controlled by the Ministry of Land Communications. The administrative structure resembles the large railroad companies in the United States. The central administrative office is functionally organized into normal railroad departments, traffic, power, roadbed and construction, communications, and administration. Each department has both central and field staffs to supervise its operational and administrative responsibilities. Each of the regional offices is a smaller replica of the central office, and each of the district offices is yet a smaller copy.

The Soviet railnet is divided into 10 recently organized administrative regions. Each of the regions includes from 3 to 7 districts with 55 districts composing the entire USSR network. Each of the district headquarters administrates various amounts of lines but averages about 1,200 miles consisting of from 4 to 11 operating divisions. The amount of track in an operating division generally varying inversely to the complexities of operation and the volume of traffic, ranges from 60 to 500 miles.

European USSR includes, either partly or wholly, 8 regions and 36 districts, administering about 41,800 route miles (TABLE I-4). Wholly beyond the limits of European USSR are the Central Asia and Far Eastern regions.

The supervisory channels are comparable to any line and staff organization, i.e., a technical and a command and administrative channel. For example, the head of the traffic department of an operating division is under orders from both the director of the division and the head of the traffic department of the district (the next higher echelon and geographical unit). Some conflict of orders does occur when the technical supervisory personnel issue direct orders outside of the administrative or command channel between echelons. In 1943 all but unskilled labor personnel was militarized and brought under martial law in order to strengthen the discipline of the railroad workers. So far the military status has not been revoked.

The number of employees for each mile of running track is an indicant of administrative and work efficiency. The number of employees has varied as follows: 971,000 in 1928; 1,526,000 in 1932; and 1,512,000 in 1937. A comparison of those numbers with the amount of operating line reflects a 50% increase of employees for each mile between 1928 and 1932, but a reduction in 1937 from the high rate of 1932. The organization is far below the efficiency of railroads in other large countries. The contrast between USSR railroads and the private companies in the United States is extreme. In 1937 there were 27 employees in the USSR as compared with 6 in the United States for each mile of operated running track.

The government has established a secondary school system and the Railway Transport Institute for higher learning to train railroad employees in all aspects of the industry. The existing administrative and technical staff personnel has had some technical training.

3. PATTERN OF THE RAIL NETWORK.—The railnet of European USSR resembles a spider web formed on the 11 arteries radiating from Moscow in all directions (FIGURE I-11, and PLANS 22 to 25). Surrounding Moscow is a 35-mile belt line which forms a hub to which these radiating lines are connected. At increasing distances from Moscow are other lines which form a series of nearly complete concentric rings to connect all of the radial lines. The

TABLE I - 4

DISTRIBUTION OF EUROPEAN USSR RAILROADS BY REGIONS AND DISTRICTS (1941).

Administrative regions and districts	Administrative headquarters	Route trackage
		Miles
NORTHWESTERN:		
Estonian	Tallinn	861
Kalinin	Rzhev	1,111
Kirov	Petrozavodsk	1,228
Latvian	Rīga	2,014
Northern	Vologda	1,243
October	Leningrad	1,485
Pechora	Kotlas	926
WESTERN:		
Belorussian **	Gomel	1,668
Belostok	Grodno	1,197
Brest Litovsk	Baranovichi	972
Lithuanian	Vil'nyus	1,161
Western	Smolensk	1,430
SOUTHWESTERN:		
Kishinev	Kishinev	1,105
Kovel'	Kovel'	877
L'vov	L'vov	1,546
Odessa	Odessa	1,454
Southwestern	Kiev	1,305
Vinnitsa	Vinnitsa	1,301
CENTRAL:		
Gor'kiy	Gor'kiy	1,077
Moscow Belt	Moscow (Moskva)	137
Moscow-Donbass	Kashira	1,182
Moscow-Kiev	Kaluga	1,552
Moscow-Kursk	Moscow	1,139
Moscow-Ryazan'	Moscow	1,155
Yaroslavl'	Yaroslavl'	1,059
DONBASS:		
South Donets	Yasinovataya	870
Southeastern	Voronezh	889
Southern	Khar'kov	1,517
Stalin	Dnepropetrovsk	1,706
Stalingrad	Stalingrad	920
North Donets	Artemovsk	1,062
VOLGA:**		
Kazan'	* Kazan' (1,645)	1,378
Kuybyshev	* Kuybyshev (1,369)	1,156
Ryazan'-Ural'sk	* Saratov (1,327)	1,167
CAUCASUS:		
North Caucasus	* Rostov (1,622)	357
URAL-SIBERIAN:**		
Perm	* Molotov (991)	582
Total		41,789

* Only part of region in European USSR; total miles in the Administrative District are enclosed in parentheses.
** White Russian SSR.

ring closest to the Moscow belt encircles the city at distances ranging from 30 to 60 miles, and the ring farthest is about at the perimeter of the JANIS 40 area. The pattern of radial lines and concentric circles is densest in the area from Leningrad counterclockwise to Rostov-na-Donu. In the north and east the pattern nearly disappears, connecting links becoming fewer in number until the system becomes wide meshed and sparse.

a. Moscow belt line.—Each of the 11 principal lines has its own terminal on the belt line. Although well located, the terminals are usually congested because of inadequate size for the increasing rail traffic. There are no grade crossings, intersections being either elevated or depressed. Because of the level topography of the area and the necessity of observing maximum grade limits, such an arrangement requires an excessive amount of trackage for interchange connections and grade approaches. This elaborate intersection system was adopted in the early development of railroads, because there were no brakes on the cars and there was no sure and safe way to control

them at crossings. Later, however, as cars were equipped with brakes they were distributed at every sixth or seventh place throughout the length of the train in order to provide maximum control while trains were being shunted over grades.

Electrification of the belt line has been under way for some time and the line now may be entirely electrified.

b. Northwest sector (PLAN 22).—This sector includes the important shipping and shipbuilding center, the large industrial city of Leningrad. The railroads in this part of European USSR focus on Leningrad in a pattern similar to the radial pattern from Moscow. Out of Leningrad lines run to the important ports of Murmansk, Tallinn, Rīga, and connect with the other ports in the area. Important lines also connect directly with Poland, Finland, and the Ukraine. The fastest trains in European USSR are operated on the line between Leningrad and Moscow.

Several lines in this area are segments of the several concentric circles that arc around Moscow to provide connections with all the radiating lines at various distances from the city.

c. Northeast sector (PLAN 23).—The density of rail lines is less in this part of European USSR than in any other sector. The two more important lines are 7 and 8 which radiate from Moscow. Line 7 is the northernmost of the European USSR lines connecting with the trans-Siberian railroad. Line 8 is the connecting link between Moscow and Arkhangel'sk. The newly built line to the Pechora coal fields and the Ust'-Ukhta oil fields branches from line 8 at Konosha.

Three transverse lines to the west connect with lines to Leningrad. The northernmost branches at Obozerskaya and connects with the Murmansk line at Belomorsk.

d. Southwest sector (PLAN 24).—This quadrant of European USSR includes the rich agriculture regions of western Ukraine and the vast Pripet Marshes. In this area the mesh is more closely knit than in any other quadrant. Scarcely any of the area is more than 25 miles from a rail line. Important lines connect with Poland, Czechoslovakia, Hungary, and Rumania on the west, and to Odessa and other ports on the Black Sea.

Several lines swing in an arc across the radial lines in this area to connect the northwest area with the southern and eastern parts of European USSR. The only 4′8½″-gage line known to be in operation as of 1947 is between Kiev, Kazatin, Zhmerinka, L'vov, and westward. This standard-gage line formed a double-line with the 5′0″-gage lines 3 and 16 between the same points. The Soviets were using this standard-gage line to bring in the dismantled plants and machinery from the defeated countries without need for reloading.

In this area are 8 of the 11 tunnels in European USSR. Five of the tunnels are immediately north of Sevastopol' on line 4. The other three are on less important lines; two on the line between Stry and Mukachevo, and the third is about 20 miles south of Yaremtsa.

e. Southeast sector (PLAN 25).—In this part of European USSR is the most important network in the Soviet railroad system, with the exception possibly of the Moscow belt system. The important Donbass net has a large amount of originating freight, as well as a considerable amount of through freight. The Donbass is connected with three main lines to Moscow, and northward over them are carried coal and iron from the region. These trunk lines connect Moscow with the Black Sea and Sea of Azov ports and the Caucasus via Rostov.

Also in this area is the important lower Volga region and the important Caspian Sea traffic entering the area via the port of Astrakhan'.

Two tunnels are on a single-track line southeast of Voroshilovgrad.

Several of the lines that are from the northwestern part of European USSR terminate at the north – south line 6, the westernmost of the three lines which run approximately parallel from the south coast to Moscow.

4. VULNERABILITY.—Principal cities such as Moscow, Minsk, Leningrad, Brest, Khar'kov, Kiev, Briansk, Rostov-na-Donu, and L'vov, where there are considerable operating and repair facilities, are highly vulnerable in terms of relative denseness of railroad targets. The most vulnerable point in the Moscow area is Zheleznodorozhnyy Rayon (55°47′07″N, 37°39′05″E) which contains three rail terminals, yards, and important shops within a small area. Those static facilities would normally contain a large amount of equipment, rolling stock, and motive power. On the other hand, this density alleviates the degree of vulnerability because of the alternate routes for rerouting of traffic, and the ready availability of repair labor, material, and equipment. Although Moscow is the most important rail center, the network is not particularly vulnerable at this point. Considerable destruction would be required for example, to effectively disrupt rail traffic to and through the city because Moscow has 11 radial trunk lines with both direct and indirect connections. The inner belt line and the outer encircling line with numerous junctions would permit traffic to be rerouted with a modicum of interruption.

The thinly spread sections of the railnet, especially the single-track lines or parts of lines, in contrast to the railroad centers, present various points where destruction of lines and trains on the lines would create a stacked-up condition of traffic which would have to be unsnarled before repairs could be started. Trains on such lines would have to be backed to the nearest junction and clearance line to allow the work trains to be brought to the damaged section. The lack of highway routes and equipment in these remote areas of European USSR generally restricts transportation of repair freight to the damaged line. European USSR areas susceptible to this kind of interruption are the remote and sparse divisions of the north through east to southeast. The lines in those areas are extremely short of alternate routes, junctions, repair equipment and facilities, and even readily available labor. The longer operating divisions entail a thinner distribution of the available repair facilities and personnel.

Notably among the sparse parts of the railroad network are the lines 8 and 9 from central European USSR to the north coast. There are only three transverse lines between these two important routes. The northernmost, Belomorsk (on the Murmansk line) to Obozerskaya (Arkhangel'sk line), is 300 and 400 miles respectively north of the next transverse line between these two important trunk lines. The severance of these lines would practically isolate the north coast area from the interior of European USSR. When not frozen over the Stalin White Sea-Baltic Canal, terminating at Belomorsk, would be capable of only a small amount of relief movement.

The few tenuous lines from European USSR to the east and beyond to Siberia have no alternate routes, and the rail connection with the oil fields of the Caucasus is via lines to Astrakhan' and Rostov-na-Donu. There are no alternate routes and the junctions south of Rostov and Astrakhan', are few. Suspension of rail traffic through

Rostov and Astrakhan' would place the entire burden on the inland waterways and Black Sea shipping.

Two rail lines connecting the Crimea Peninsula with the mainland are single-track and the easternmost, line 4, crosses the soft-bottomed Sivash or Putrid Sea (Gniloye More). That crossing and the five tunnels and two bridges immediately outside of Sevastopol' make line 4 exceptionally vulnerable.

Thousands of bridges are required to cross the numerous rivers, streams, canals, and marshes of the Russian plain. The compacted roadbed through the marshes at curves and bridge approaches are points which, although repaired, would necessitate slow-order traffic for an extended period. Many of the bridges across the larger rivers, such as the Volga, Dnepr, Oka, Daugava (Zapadnaya Dvina), and Neman (Niemen) are particularly vulnerable. Many of the war-destroyed bridge replacements are temporary expedients and many others, although not destroyed, have been structurally weakened. Six bridges spanning the Volga are the vulnerable links of the east with the central and western European USSR.

More than one-half of the country's trackage was concentrated in the area overrun by the Germans (see FIGURE I-11 for limits of the farthest German penetration) and for a few years that part of the railnet will be doubly vulnerable because of the inadequacy of the reconstruction, but subsequently will be improved and slow order operation eliminated.

5. RECONSTRUCTION AND EXTENSIONS.—Although railroads were repaired expediently as the Soviet forces followed in the wake of the retreating Germans, the government was confronted with a tremendous task of reconstruction and rehabilitation of more than 25% of its railroad trackage and about 13,000 railroad bridges. Simultaneously the lines and bridges were to be strengthened for the planned increasing loads and greater volume of traffic.

The reconstruction, according to the announced Fourth Five-Year Plan, was scheduled to provide single-track service initially and subsequently to be followed by the second track so that by 1950 the railroad network would be restored to its prewar condition with some improvement. By October 1947, all of the former double-track lines in the German-occupied area were reportedly restored to single-track condition, and some trunk lines entirely or partially restored to double-track operation.

During 1946-1950, in addition to the reconstruction and strengthening of lines, 4,500 miles of new railroads and 3,550 miles of new second tracks are planned, but almost exclusively for the Urals area, Siberia, and Central Asia.

Repair of automatic block signals and installation of new extensions is planned along with other improvements, and it is estimated that by July 1947 about 5,300 miles of line were equipped. Line 1 between Leningrad and Moscow is reported fully automatic.

The current Five-Year Plan envisages great strides in electrification extended over 3,300 miles of lines. Most of this, however, is conversion and new construction of lines in the Urals and in Siberia. About 200 miles in European USSR was to be rehabilitated.

The locomotive and rolling stock equipment on the USSR railroad was only slightly below the 1941 position in numbers of pieces. Reductions through war losses and retirements were almost offset by lend-lease and captured equipment. Captured freight cars were smaller in capacity than lost cars so the lost freight carrying capacity of the equipment was not equally offset. The goal for 1950 is 30,500 locomotives, 450,000 two-axle and 325,000 four-axle freight cars. The number of passenger cars on hand is not known but 6,000 steel cars are to be built by 1950, and, allowing for retirements, should provide an inventory of about 37,000 cars.

(b) Railroad plant and equipment

1. TRACK AND RIGHT-OF-WAY

a. Track.—In 1941 double-track lines of the 21 strategic railroad routes in European USSR (FIGURE I-11) totaled about 9,240 miles or 63% of the total trackage. The other routes (PLANS 22 to 25, inclusive) are mainly single-track lines. At the end of World War II the whole network showed evidence of war-necessitated neglect and the tracks were in very bad condition. Second main tracks, yards, and sidings were cannibalized for replacement purposes on the main lines. About 6,200 miles of tracks destroyed by the Germans were replaced with broken rails. Regional distribution of the 1946-1950 program is unknown but the total calls for about 31,000 miles of new rails, and for replacement of about 40% of the worn-out rail. The tracks of the heavy-duty lines, Moscow – Leningrad and Moscow – Donbass, were the first to be strengthened under the current program.

b. Gage.—The prevailing gage of the USSR railroads is 5'0", but there are small amounts of others ranging from 60 centimeter to 4'8½". There are some 75-cm.-gage lines which are integrated industry or mine facilities. Although state-owned, that trackage is not a part of the general railroad system and administration. In White Russian SSR in January 1941 there were about 245 miles of single-track narrow-gage and 275 miles of 4'8½" gage. As of 1947 about 420 miles of 4'8½" single-track line and a single-track 5'0"-gage line formed a double line between Kiev and Poland, via L'vov. In addition, the annexed Baltic States contained both 4'8½"-gage lines and several widths of narrow-gage lines, as well as 5'0"-gage line. The lines in the Baltic States which in 1941 were 4'8½" gage, (758.7 miles in Lithuania and 190.1 miles in Latvia) subsequently have been converted to 5'0" gage. Distribution of railroad mileage by gages in the Baltic States as of 1941, the converted 4'8½"-gage mileage being included with 5'0"-gage mileage, is:

COUNTRY	MILEAGE BY GAGES				
	5'0"	*Meter*	*75 cm.*	*75 & 60 cm.*	*60 cm.*
Estonia	448.6	...	419.4	...	...
Lithuania	758.7	...	...	321.9	...
Latvia	1,462.7	24.9	319.4	..	341.1
Total	2,670.0	24.9	738.8	321.9	341.1

c. Grades and curves.—The terrain of European USSR is generally flat and a large portion of the railroad alinement is tangent and most of the grades are less than one percent. The curves on which there are data are generally moderate, but there are some locations where the degree of curvature is sharp; the sharpest is 8°44', a radius of 656 feet. The sharper curves are generally at terminals and junctions, but some are in the rougher terrain areas. No data are available as to whether the practice of grade compensation on curves is followed. Although the grades are generally gentle, there are a few sections of track where the grade is as much as 2.5%; a somewhat larger number are between 1.25 and 1.50 percent. These maximum grades compare with some short lengths of maximum grade of approximately 4% in the United States. The steep grades are more frequent in the southeastern part of European USSR, but there are some on Leningrad – Murmansk line. Known grades and curves on the 21 strategic lines are shown in TABLE I-6.

d. Roadbed and ballast.—Local conditions require slight variations of some sections from the standardized roadbed diagrams. Deviations are mainly from specified slopes of cuts and fills whereas widths of subgrade tops and ballast sections are uniform. Ballast is possibly the worst deficiency of the USSR roadbeds. Most of the ballast is sand, unstable when wet, and when very dry blown away. Between these extreme conditions sand normally is a poor ballast with inadequate load-bearing and distributing properties. A few sections have stone, gravel, slag, or shell ballast, but sand is more prevalent. In 1938 only 6.7% of the railroad mileage had rock ballast. The Fourth Five-Year Plan provides for rock-ballasting of about 9,300 miles of track.

The kinds and sources of stone ballast (FIGURE IX-58) are:

KIND	LOCATION
Basalt	Karelia
Granite	Karelia, Ukraine, Caucasus
Limestone	Widely distributed, principally southeast quadrant from Moscow
Sandstone	Urals, Caucasus, southwestern
Trachyte	Chiefly in Caucasus

e. Ties.—Wooden ties are exclusively used, being principally pine from the area north of a line from Kiev through Kuybyshev to Sverdlovsk. Ties constitute a large part of the timber freight which is about 12% of railroad freight. During 1934, the last year of available data, 19.6 million ties were used by the entire USSR railroad system and probably for all purposes. During the same year 43.3 million ties were laid in the United States for replacement on about 350,500 miles of track. New lines constructed in USSR during 1934 amounted to about 1,600 miles of first and second track, and, on the basis of an average of about 2,770 ties used on a mile of track, about 4,432,000 ties would have been used for the new track construction. This would indicate that about 15,168,000 ties were used for replacement in the entire USSR during 1934. Information on European USSR is not separable, but it probably is proportionate to the whole system.

During 1934 the replacement ties laid in the United States averaged 123.6 a mile as compared with 240 in USSR. This indicates that the service life of the ties in the USSR was about one-half of that of ties in the United States. Soviet data indicate that the service life of treated and untreated ties are comparable to United States experience, about 4 to 5 years for untreated, 8 to 10 for zinc-treated, and 12 to 15 years for creosoted ties. The larger number of treated ties used in USSR are pressure creosoted. Although the Class I railroads in the United States use mostly treated oak for ties, the USSR has had to prohibit continued use of that type of timber because of the lessening supply, and to use pine almost exclusively.

The spacing of ties varies in the USSR as it does in the United States depending upon the many variables on the specific line and sections of lines. Known data for specific points on the 21 strategic and branch lines are shown in TABLE I-6. Assuming an average nine-inch-wide tie the number of ties range from 3,750 per mile (7.9″ apart) on bridges to as low as 1,730 per mile (27.6″ apart) on principal lines (TABLE I-6). The usual 2,580 to 2,960 ties, or an average of 2,770 ties for each mile of line, compares with an approximate 3,200 ties in the United States. It is expected in the Fourth Five-Year Plan to increase the average number of ties by about 50.

f. Rail.—A "T" shape rail, similar to that used in the United States, is standard for the USSR, but the quality of steel is poorer and the weight is less. The weight of rail is being gradually raised and the Bessemer process is being slowly supplanted by the basic open hearth method, following the experience of United States production, to raise the quality.

Rail weighing 77.4 pounds per yard or more was laid on about 23.2% of the line mileage existing in 1933. By 1938, rail sections weighing 77.41 and 87.9 pounds a yard were in use on about 51.9% of the railroad mileage. World War II interrupted the planned introduction of two new dimensional types of greater weight. Under the Fourth Five-Year Plan those two and yet a third type have been authorized for production with some tonnages already rolled toward the planned goal of about 31,070 miles of new rail. These new types (C-50, I-U, and 65) weigh 102.01, 87.9, and 131.04 pounds per yard and the dimensions are approximately the same as similar weight United States rails.

The lengths of rail sections have been generally longer than the standard lengths of 33, and now more commonly, 39 feet used in the United States. The most commonly used length in the USSR is 41 feet with specifications similar to universal practice permitting variations in length. Specified standards for Soviet rail sections in feet, with the year of adoption are:

PRIOR TO 1924	1927	1946
35.	32.81	41.
42.	41.	82.
49.2	49.2	

g. Signaling.—A Soviet commission visited the United States in 1929 and, after study of the signal systems in use, placed orders for experimental signal squipment. Test installations were made of several types with color light signals and by 1932 there were 121 miles of equipped line. Progress was slow and most of the equipment was German and Belgian manufacture which proved to be unsatisfactory and, in 1938, the signal equipment of some of the lines was dismantled.

Improvement and development continued until 1941 and about 5,160 miles of line were equipped with automatic signals. Most of this equipment was damaged, destroyed, or removed by the Germans, but by the end of 1945 about 75% had been restored to service. During the following 18 months about 1,400 miles of line were equipped with new electric block signaling. This would indicate that about 5,270 miles of automatic block signaling equipment was in operation in July 1947.

The USSR-manufactured signal equipment has not proved entirely satisfactory. Short circuits and grounds, combined with uncertain operation of relays and other Soviet-manufactured parts, have caused signal failures and a resultant number of accidents. Much of the short circuits and ground failures are caused by poor insulation, both material and personnel inefficiency in manufacture being contributory causes.

Much signaling equipment is required to equip the remainder of railroads in all of the country, as well as in European USSR, and to replace the equipment on the temporarily repaired systems. On the lines not equipped with automatic block systems, the staff or tablet system is used.

h. Electrification.—Initial electrification was in 1926 on the suburban lines of the Baku area, using overhead conductors to supply direct current at 1,200 volts.

The first installation in European USSR was a 1,500-volt d.c. system adopted and first installed on the 11.8-mile Moscow suburban area section to Mytischchi section on the line to Arkhangel'sk. Conversion continued in the Moscow area until 1936 by which time about 112 miles of the suburban lines were electrified.

In the Leningrad district 44 miles of route were converted during 1933-1934. In 1932 a start was made with electrification of main lines in mountainous and industrial areas using a 3,000 volt d.c. system. By 1939, there were 827 miles of electrified line with a total trackage of about 1,100 miles located in the Caucasus, Urals, Donbass, Krivoy Rog, Kuzbass, Moscow and Leningrad areas, and on sections of the Leningrad – Murmansk line. It was reported that 1,242.8 miles of line were electrified by 1942, and in 1946 European USSR contained 653 miles of electrified lines.

Railroads leading in and out of Moscow, Leningrad, Tallinn, and Kiev are operated on steam-generated current. Elsewhere there are hydroelectric developments as well as some steam plants. Line construction has been designed for direct current of 3,000 volts on main lines and 1,500 volts on suburban lines supplied by overhead conductors and pantograph contact. The electric locomotives generally employed have a tractive force estimated to be about 55,000 pounds at the rims at about 10 miles per hour. A new-type electric locomotive is reported to have been placed in operation in 1946, but details of its characteristics are not available. A special transfer switch has been installed on the locomotives to permit operation at either voltage.

The Fourth Five-Year Plan incorporates a program for electrification of existing lines and new-constructed lines so that by the end of 1950, an aggregate of 3,309 miles of electrified lines is expected. The largest part of the electrification is to be carried out on the lines in Siberia and the Urals, but about 186 miles in the Moscow area were scheduled for 1946.

2. STRUCTURES AND FERRIES

a. Clearances and load limits.—Specifications of 1860 remained in effect until 1926 when new standards were adopted, but these remained in effect only 10 years. No diagram of the latest standards of construction limits is available, but clearances and load limits were established for the 75-cm.- as well as 5'0"-gage lines. It is probable that these latest specifications are designed for the maximum-dimensioned equipment now being constructed in the country. Load limits on bridges are shown in TABLE I–3 where data were available.

The tunnels of the Moscow subway system are about 18 feet in diameter.

In addition to clearances normally prescribed, there are standards for fences, telephone and telegraph poles, guard huts, and other structures to be placed at certain minimum distances in the tundra zone to overcome some of the problems caused by snow drifting. In that region platforms are not to be built higher than the rail.

b. Bridges, culverts, and tunnels.—The comparatively flat terrain of European USSR made it necessary to utilize only a relatively small number of tunnels, but the many streams and rivers require a tremendous number of bridges and culverts. The rivers are subject to wide seasonal variations and the bottoms consist of layers of sand, gravel, and clay, with solid rock at considerable depth in most places.

The types of bridges most frequently used are simple truss spans, cantilevers, and steel arches. The method of detail design of steel-span crossings is similar to modern American practice and the quality of structural steel used is about the same as in the United States. Replacement or strengthening of old bridges and construction of new crossings has kept pace with the new and heavier equipment used on the lines. The World War II damage and destruction to bridges is estimated to have been between 40 and 50% of all railroad bridging. As a result, the Soviet Government was faced with the task of rebuilding about 13,000 bridges with a total length of about 186 miles.

Complete data are not available on the bridges of the country or even on the 21 lines discussed as strategic lines. The more important and known bridges on those lines are included in the brief discussion of the lines, and TABLE I-3 includes the axle load limitations on bridges of some sections of several of the lines. A summary of the 428 railroad (a few are dual highway) bridges located on FIGURE I-11 and PLANS 22 to 25 is shown in TABLE I-5.

TABLE I - 5

PARTIAL SUMMARY OF RAILROAD BRIDGES

Bridge lengths	Number	Total length	Typical span length
Feet		*Feet*	*Feet*
246- 328	112	31,414	59- 82
328- 820	201	111,844	180-213
820-1,476	68	73,097	246-361
1,476 and up	47	138,392	361-508
Partial total	428	354,747	

There are many culverts located along the lines, especially where the track alinement is over level or gently sloping land, but data on numbers and dimensions are sketchy.

Partial data are available on 11 tunnels totaling 26,036 feet in European USSR. Five of these tunnels, totaling about 5,935 feet, are on line 4 immediately out of Sevastopol'. One 4,216-foot tunnel is on line 13, just east of Kaunas and between Kaliningrad and Vil'nyus (Wilno), and this is the only known double-track structure. The longest, 6,765 feet, is at 48°23'N, 39°14'E, southeast of Voroshilovgrad, and a shorter 2,625-foot tunnel is a few miles farther southeast. Two others are on the single-track line between Stry and Mukachevo; the one at 48°48'N, 23°21'E, is 5,249 feet long, and the other located about 15 miles out of Stry is 426 feet long. The eleventh located tunnel (48°20'N, 24°19'E) about 20 miles south of Yaremtsa is 820 feet long. All but possibly two, the 426- and 820-foot tunnels, were either damaged or destroyed by the retreating German troops in 1942-44.

c. Ferries.—Little information is available on the location or details of ferries operated in connection with the railroads. There is a car ferry between Stalingrad and Krasnaya Sloboda, across the Volga river, connecting line 18, on the right bank, with the line to Verkhniy Baskunchak, on the left bank. During the Stalingrad siege a car ferry was operated across the Volga at Astrakhan' to connect the war exigency line, Baku – Astrakhan', with the Astrakhan – Saratov line (19) in order to transport oil northward from the fields of Baku. Crossing of the Severnya Dvina from Arkhangel'sk on the right bank to the railroad station on the left bank is via car ferry during the months when the river is unfrozen, but after a solid freeze tracks are laid on the ice.

3. FACILITIES.—War effect on yards, shops, engine houses, stations, freight storage buildings, water and refueling points was equal to the destruction and damage of the railroads as a whole. The USSR must accomplish

considerable repairs of the operating facilities in order to realize maximum utilization of the available equipment.

a. Shops.—Work and repair shops are usually placed at intervals consistent with the operating demands of the lines. Each administrative district has at least one shop which is adequate for the complete overhaul of cars and locomotives. Some of these larger shops at more important centers are equipped for the production of new units.

b. Engine houses.—Most of the Soviet railroad engine houses are rectangular and arranged in echelon instead of the more efficient semicircular and turntable-equipped roundhouse. The rectangular house necessitates considerable grading, tracks, frogs, and guard rails to provide access.

c. Stations and terminal yards.—Many of the stations and terminal yards have been reconstructed and enlarged, and new ones have been built as the traffic has required. The yards are located at nearly all junction points and several are situated in the larger centers of rail operations. Moscow contains terminals of 11 trunk lines; Leningrad has 5 large terminals; and numerous cities have two or more terminals. The stations and yards of the smaller cities and towns are smaller and simpler than those of Moscow and Leningrad. Along the lines, stations are spaced at fairly short intervals in European USSR and average distances vary from a maximum of 8.3 miles on line 12 to a minimum of 3.7 miles on line 17.

d. Watering and fueling points.—Data are incomplete but known data of the number and average distances apart on the 21 strategic lines are shown in TABLE I-6. On many of the lines water is available at the stations in addition to points along the route. Considerable war damage was inflicted on the water towers and tanks, but damage to fueling points, except oil, only imposed slight hindrance to the operations. There are no data indicating operating difficulties because of inadequate distribution of fuel or water points.

e. Storage facilities.—Incomplete and meager information is available on freight storage facilities at railroad stations and terminals. Only five to eight warehouses or storage sheds have been reported along some of the most important lines. Prompt pickup of consumer goods, most of which is in short supply, may explain the small storage requirement in connection with the USSR railroads. These facilities are presumed adequate for current needs and supplementation to meet any growth of need could be readily accomplished.

4. EQUIPMENT.—The postwar 5′0″ gage equipment situation of the Soviet railroads was little poorer than the 1941 inventory in numbers of locomotives and cars, but the effective carrying capacity was considerably less. Acquisitions, consisting of lend-lease, captured, and recovered equipment just about offset the war losses and retirements. At the end of 1945, it is estimated, the USSR railroads had about 25,300 to 25,900 locomotives, 770,000 to 842,000 freight cars (in terms of 2-axle units), and about 34,100 passenger cars. The goal for 1950 has been set at 30,500 locomotives, 450,000 2-axle and 325,000 4-axle freight cars, and construction of 6,000 new steel passenger cars. The passenger car inventory, allowing for some retirements, should about equal the 1941 inventory of 37,000 cars. There are sparse data on equipment for other gages.

a. Locomotives.—It is estimated that in 1941 the Soviet Union had about 27,000 5′0″-gage steam locomotives of 19 different types. Data on the numbers of diesel and electric locomotives are not available.

The 5′0″-gage steam locomotives varied in wheel arrangement from 0-6-0 switch engines to two main line locomotives which reportedly had a 4-14-4 wheel arrangement and from dimensional data had an estimated starting tractive effort of about 76,900 pounds at the rims. Data on locomotives, as well as all other equipment, are inadequate for an inventory listing in any classification. The rated tractive effort of most of the main line equipment ranges from about 31,000 to 58,250 pounds with an average below that of United States equipment. The equipment is generally lighter than U. S. locomotives.

There are no data on the motive power of other gages, except that in March 1939 the Estonian 75-cm. lines had 92 locomotives.

Most of the steam locomotives use coal in this area, but oil and wood are also used. Wood is used on the non-electrified sections of the lines to Murmansk and Arkhangel'sk.

Many of the locomotives were more than ten years old in 1941, and the inadequate maintenance given all equipment during the war contributed materially to the appalling condition of the equipment at the end of the war. About 2,000 locomotives will have to be retired by 1948, but plans envisage construction of 2,350 larger units in the same period to reach an inventory of about 26,250. Withdrawal from service may be delayed to retain a higher inventory, possibly 27,200. The number of units in operation in European USSR is unknown.

Data on diesel-electric and electric motive power are meager. Some diesel units are used for switching and on long runs in places where water supply is poor or coal is uneconomical. In 1946 some 1,000-horsepower internal-combustion units were placed in operation. Most of the electric main-line units are adapted for operation on either the 1,500-volt suburban systems or the 3,000-volt main lines.

The Soviet Union plans to produce 865 diesel-electric units during the Fourth Five-Year Plan, compared with only 17 main-line diesels constructed prior to the war. In 1937 during the Second Five-Year Plan 110 units were scheduled for production, but only one locomotive was built and the total production for five years was only 15 units. Premised upon that performance toward meeting set goals it is estimated that the diesel inventory will be not more than about 450 locomotives by 1950, the end of the Fourth Five-Year Plan.

The inventory of electric locomotives is similarly not very clear. It is known that 162 units were listed on hand at the end of 1937, and it is estimated that domestic production increased the inventory to 247 units by June 1941. Apparently no electric locomotives were lost during World War II and under the various lend-lease arrangements 96 units were received. Reportedly 178 main-line electric locomotives were removed from Germany. These acquisitions, with no allowance for retirements, would make the total inventory as of December 1946 about 520 units. If the goal is met the electric units would form an inventory of about 1,050 units, but it is believed that the full schedule will not be met and the actual inventory will be about 800 units. Several known types are: the passenger service "Pb 21" with a 37,500-pound tractive force and a maximum speed of 87 mph; the passenger-freight "VL" with a maximum speed of 53 mph; and the "SS" freight unit with maximum speed of 43 mph. The Moscow area has some electric motor cars.

b. Rolling stock.—The Soviet Union is attempting to meet the compound traffic requirements of long haul and heavy loads, comparable to the United States

traffic, and the frequency of trains and small quantities of freight, which is predominant in Europe. The trend is development of both passenger and freight cars, as well as motive power, along lines followed by the American railroad companies.

Prewar freight cars were mostly 2-axle units with capacities ranging from 17 to 22 short tons. Even at the beginning of the war, some of them were only hand-brake equipped and had only link and hook couplers. The 4-axle cars amounted to about 25% of the units in the pool in 1941. New cars will be the heavier 4-axle units and by 1950, despite war loss of productive capacity, it is planned to have 325,000 or 42% of the total inventory consisting of the larger cars to supplement the 450,000 2-axle units. The freight cars constructed today are generally all-metal, 55- to 77-short ton capacity, and equipped with automatic couplers and brakes. Existing proportion of the various types of cars is unknown, but it is estimated that about 9% are 13,200-gallon tank cars which are largely used in the Baku-Batumi oil traffic. The announced ideal distribution of types is:

TYPE	PERCENT
Boxcar	38
Flatcar	30
Gondola/Hopper	20
Tank car	10
Refrigerator	2

Passenger cars are secondary in priority, but the general trend of improvement is being applied to this equipment. Old cars were mostly wooden and classed as either hard or soft, according to whether or not the seats were upholstered. The backs of the seats in both classes may be swung up over the seats to form berths. Most are side-corridor compartments cars, but some of the hard class cars are not closed off from the corridors. All of the old cars provide primitive accommodations by American standards.

Two trains of seven new all-metal cars are in service, one on the Moscow – Leningrad run and the other on the Moscow – Simferopol' part of line 4. The cars are 77'6" long, weigh 60.6 short tons, and are equipped with a generator and year-round air conditioning. The construction program includes 6,000 of these cars to be built by 1950. With about 34,100 passenger cars on hand at the end of the war and the addition of these new cars, less some essential retirements, the total inventory in 1950 will probably equal the 1941 estimated total of 37,000.

Fifteen long-distance, 25 local, and 240 new suburban trains are to be placed in service. The latter will make 6% more suburban trains in service than in 1941.

c. Service equipment.—Track-laying machines are in use, but the numbers and types of other special and labor-saving equipment are unknown. There is a considerable amount of this service equipment and the inventory includes some completely self-contained steam-operated mobile electric units for emergency and rehabilitation work.

(c) Strategic lines.—The USSR railnet is strategically more important than either highway or waterway systems. In time of war, the scarcity of vehicles and hard-surfaced highways, and the inadequacy of the waterways, place an additional burden on the normally overloaded railroads. There are few highways suitable for long-distance transport and the waterways are shallow and considerably affected by the extreme seasonal variations. Except for locally consumed products there is hardly an item of commerce not borne by rail in the traffic from producer to consumer. The paucity of paved highways makes the rail system essential for personnel movement when long distance and short time are elements of the requirement.

The map of the Strategic Transportation Systems (FIGURE I–11) shows the more comprehensive railnet in comparison with the sparse waterways and highways. Pipe lines also are shown on the map. A comparison of this map with the more comprehensive map (PLANS 22 to 25) will show the supporting networks of all forms of transportation.

Twenty-one lines have been selected as the frame of the railroad network of European USSR. Other connecting lines under certain circumstances may assume importance over these selected lines. For example, cutting of the line between Belomorsk and Leningrad would immediately give great importance to the line from Belomorsk to Obozerskaya for continued use of the port of Murmansk (PLANS 22 and 23). In fact, there is hardly a line without some strategic value; all of them contribute toward the maintenance of the political and industrial integration of the country.

Eight of these railroad lines (1 to 8) connect Moscow with the perimeter of European USSR, principal USSR ports on the Baltic, Black, Arctic, White, and Caspian Seas. Those same lines connect with other European lines on the west and the eastern and southern areas of the USSR. Nine lines (9 to 13 and 17 to 20) branch from terminals on the eight radial lines to form alternate routes and through connections to intermediate areas. Four lines (14 to 16 and 21) in the southern part of European USSR swing through an arc to connect the west with the eastern parts of the area. The interlacing of these lines with the other rail routes is discussed in Topic 7, A, (1), 3, above.

The total length of these 21 lines is about 14,725 miles, of which about 9,240 miles were double-tracked lines in 1941 and comprised almost all of the double-track railroads in European USSR. According to the Fourth Five-Year Plan, about 12,520 miles of these 21 strategic routes will be double-tracked by 1950. Pertinent information on these strategic lines are summarized in TABLE I-6.

All of these lines, as well as nearly all of the connecting lines, are 5'0"-gage track except sections of lines 3 and 16 which have a single-track 4'8½"-gage in lieu of a second 5'0"-gage track between Kiev and L'vov and on into Poland. In the Baltic States and White Russian USSR there are some narrow-gage connecting lines.

Each of the 21 selected strategic lines are briefly discussed in the following paragraphs, numbered in agreement with the line identifying numbers on the maps (FIGURE I-11 and PLANS 22 to 25). Additional known data are summarized in TABLE I-6.

1. MOSCOW – LENINGRAD.—An important economic and military trunk line linking Moscow to Leningrad, the largest USSR port on the Baltic Sea as well as an important industrial center. Offshore in the Gulf of Finland is the island naval base of Kronshtadt which, combined with Leningrad, is the nerve center of the Soviet Baltic Fleet.

The railroad is about 404 miles long and a key route of the "October" system. Radial lines from Leningrad and Moscow connect with the principal lines of the entire USSR network, including the annexed territories, and all bordering countries. The fastest trains of the USSR railroads operate on this line at a speed of about 44 miles an hour.

In 1941 the line was 3-track for about 26 miles out of Leningrad between Moskovskaya Slovyan and Tosno. The

remainder of the line was double-track, and by 1947 part of the war destruction had been repaired and reconstruction to a double-track route was completed.

Five known bridges longer than 328 feet are on the line. The longest (No. 34 on map) is across the Msta and is a 1,093-foot double-track structure. The next longest (No. 211) across the Volkhov river is 990 feet and single-track. A new bridge to replace this structure has been started and is scheduled for completion in 1948. The bridge (No. 179) across the Volga at Kalinin, an important inland river port, is double-track and 640 feet long. The bridge (No. 155) across Kanal Imeni Moskvy (Moscow Canal) is 640 feet long, double-track, and of reinforced concrete arch construction on concrete piers. The 328-foot bridge (No. 328) was destroyed in 1943 and subsequently repaired.

2. Moscow – Smolensk – Minsk – Brest.—This 668-mile double-track line (1947) is the main east – west route linking Moscow with western European USSR, Warszawa (Warsaw), and Berlin. Via intersecting lines it provides connections with Rīga, Latvia, and Kaliningrad (formerly Königsberg, East Prussia). In 1941 the entire line except a 37-mile section between Minsk and Negoreloye was double-track, and the route was the axis of the German offensive against Moscow.

Seven bridges ranging from 226 to 450 feet long are known to be on this line, and totaling about 2,335 feet. The longest structures are (No. 114) the 450-foot Dnepr crossing and (No. 226) the 436-foot Lesna river bridge. The 226- and 262-foot structures (Nos. 227 and 228) spanning the Vop' are auxiliary structures destroyed in 1943.

The southwest end of this line is laid across the Pripet Marshes.

3. Moscow – Kiev – Zhmerinka.—This 700-mile line is an important link of Moscow with the agricultural regions of the southwest. Kiev, the chief city along this line, ranks next to Moscow and Leningrad, and its Dnepr river harbor, Podol, is ranked as the largest inland river port of the USSR. Important rail lines to the northwest and southwest junction with line 3 at Kiev. At Zhmerinka the line meets line 16 which connects Odessa, the major Black Sea port, with L'vov and the Carpathians.

In 1941 about 289 miles of the Moscow – Konotop section was single-track but the remainder of the route was double-track line. According to the Fourth Five-Year Plan the entire line is to be double-tracked, but in 1947 one of the two parallel tracks was retained as 4′8½″ gage as converted by the Germans between Kiev and Zhmerinka. From Zhmerinka on through L'vov via line 16 and thence into western Europe this double-gage arrangement was continued to facilitate through shipment of reparations, including machinery and dismantled plants, from defeated countries into the USSR as far as Kiev.

A 53-mile section between Fastov and Kazatin is doubly used as lines 3 and 15, and in this section there is a 2% grade of unknown length. The minimum radius of curvature on that section is unknown, but immediately north of Kalinovka there is a 656-foot minimum radius of curvature.

Nine bridges more than 240 feet long and totaling 7,500 feet are on this line. The longest bridge (No. 74) is about 3,500 feet long and spans the Dnepr river at Kiev. This 12-span double-track railroad and highway bridge was scheduled for completion in 1941, but there is a possibility that there are two bridges at this crossing.

4. Moscow – Kursk – Khar'kov – Zaporozh'ye – Sevastopol'.—This 933-mile line is the westernmost of three nearly parallel north – south lines linking the capital with important industrial areas of central and south USSR and with the Donbass. Line 4 is the only line clearing to the north from the Crimea. This line is connected by several transversals to other parallel lines running from Moscow south and to the Ukraine. The southernmost of these transversals crosses the northern part of the Crimea and is the east – west line connecting all of the Black Sea and Sea of Azov ports.

In 1941, 717 miles of this route was a double-track line, with single-track sections totaling 216 miles between Sevastopol' and Novo Alekseyevka and between Fedorovka and Zaporozh'ye. From the latter town north to Moscow it was all double-tracked. The line is scheduled for reconstruction to at least 1941 track condition by 1950. It is reported that the Kursk – Khar'kov section is reconstructed as double track and time tables indicate that other short sections have been restored to double track.

Immediately out of Sevastopol' are 5 of the 11 tunnels of European USSR. These were all damaged extensively during the war. The maximum grade of 1.25% is also near Sevastopol'. There are 13 known bridges, fairly well distributed south of the Oka river where the longest (No. 162) is located. This 1,475-foot dual bridge has roadway for double-track railroad on upper level and the highway crossing on lower deck. Bridge 331 crosses part of Sivash (Gniloye More) at 46°00′N and 34°40′E and is about 535 feet long and double-tracked. At this point the Crimea Peninsula is connected with the mainland, but whether by causeway, trestle, or other structures is not reported. The bottom of the Sivash is soft, but in 1944 the Red Army effected a crossing by fill. The bridge was destroyed in 1944, but is assumed to have been rebuilt.

5. Moscow – Rostov.—This 817-mile trunk line is the central one of three parallel lines to the south coast of European USSR. It passes through the rich coal mining area and the two ports of Taganrog and Rostov en route to the Caucasus. Coal, particularly anthracite, is a heavy-volume commodity shipped to Moscow over this route. About a dozen lines cross this line to provide connections with the flanking trunk lines and the areas to the east and west.

Between Moscow and Danilovskaya the line was triple-tracked about 56 miles and the remainder was double-tracked in 1941. Soviet timetables indicate some sections already have been rebuilt to double-track condition which is scheduled for completion along the entire line by 1950.

There are 8 or 9 known bridges longer than 246 feet with one 2,050-foot single-track bridge across the Oka river at 54°51′N and 38°12′E. The bridge is steel parabolic through-type girder with 5 equal spans.

6. Moscow – Rostov.—This 762-mile line generally parallels line 5 at about an average distance of 80 miles to the west. At Rostov it junctions with the line which runs south into the Caucasus. Oil and grain from the Caucasus and anthracite from the Donbass are transported north; machinery and manufactured goods move south from Moscow and intermediate industrial centers. The line has considerable traffic, especially in the south on the Millerovo – Rostov section.

A nine-mile section between Moscow and Sovkhoz was four-tracked line and the remainder of the route was at least double-tracked in 1941. The Fourth Five-Year Plan schedules rehabilitation to 1941 condition by 1950, and a Soviet timetable indicates that short sections already have been restored to prewar condition.

At Kolomna (55°04′N, 38°50′E) there is a 1,781-foot double-track, steel deck-type truss girder bridge across the Oka river. A few miles to the northeast across the Mos-

cow river is a 791-foot double-track steel bridge. At Svoboda there are three bridges crossing the Don river. One (No. 121) on line 6 is a double-track steel diagonal deck-type truss bridge about 1,204 feet long. The other two are single-track bridges each about 1,214 feet long. All three were destroyed and replaced by the Germans in 1943. Several other shorter bridges make a total of about eight known bridges on line 6.

The right-of-way of line 6 is also line 15 between Likhaya and Zverevo (about 15 miles), and line 21 between Svoboda and Voronezh (about 55 miles).

7. Moscow – Gor'kiy – Molotov.—About 780 miles of this 844-mile line are in the area of European USSR; about 64 miles and the terminal of Molotov are outside the area limits. This section of the Trans-Siberian Railroad is the northernmost link of Moscow with the Urals. Westbound traffic consists of metals, anthracite, chemicals, and lumber from the Urals, and oil from the Ukhta area.

In 1941 the line was triple-tracked out of Moscow between Kuskovo and Zheleznodorozhnyy, about 10 miles, and double-tracked to Gor'kiy. By 1950 the line is purposed to be double-tracked, and already it is completed as far as Kirov, about 545 miles. Timetables show other short sections between Mokino and Molotov are now double-tracked.

There are eight known bridges longer than 465 feet on this line. Of the four longer bridges, one (No. 139) is at Molotov across the Kama and is 2,933 feet long and single-track. The two longest are at Gor'kiy and the third major bridge is across the Vyatka river (58°17'N, 48°19'E), in European USSR. The 3,609-foot double-track bridge (No. 205) crossing the Oka at Gor'kiy has steel central girders and 6 arched ferroconcrete spans. The other one at Gor'kiy (No. 25) crossing the Volga river is 3,360 feet long. The structure on the left bank of the river is formed by 12 concrete deck arches, and over the river bed by 4 steel through lattice truss spans of which each of 2 is about 420 feet long and each of the other 2 about 174 feet long. The type and structure of the bridge (No. 173) across the Vyatka is unknown, but it is 2,241 feet long and single-track.

At Zaporozh'ye, spanning the Dnepr, are sites of two long and very important dual bridges for branch lines to Krivoy Rog. These steel bridges, double deck with double-track electrified railroad lines on the top and single-lane highway (route 6), spanned the Dnepr, prior to their destruction in 1944, to provide connection of the important steel center of Krivoy Rog with the highway and rail route 4, Moscow – Sevastopol'. The longer (80A, highway 1128) is reported to be from 2,264 to 2,313 feet long and the other (80B, highway 1128B), 1,214 feet long.

8. Moscow – Vologda – Arkhangel'sk.—This trunk line is the only land connection between Moscow and the interior of the area with the White Sea ports of Arkhangel'sk and Molotovsk. En route to Arkhangel'sk the line passes through the industrial center and Volga river port of Yaroslavl'. During World War II lend-lease supplies delivered to the port of Arkhangel'sk were carried into the interior over this 703-mile line. Oil, coal, and ore are the principal northbound freight items, timber and textiles, southbound.

Recent reports indicate that the section between Konosha to Obozerskaya of about 183 miles has been double-tracked to increase the 1941 double-track line from Moscow to about 623 miles. The 80-mile remainder to Arkhangel'sk station, on the left bank of the Severnaya Dvina has been graded for the second track but it was unlaid in 1947.

There are three transverse lines connecting this route with the Leningrad – Murmansk route, line 9. The most northern of these three connects Obozerskaya south of Arkhangel'sk with Belomorsk on the Murmansk line. This connecting route is single-track and from the Onega branch line to the west it nears the shore line. The other two lines, farther to the south, provide single-track connections between lines 9 and 8.

The 682-mile Pechora line branches from line 8 at Konosha. In 1941 it was constructed to Vel'sk but was reported to be as far as Vorkuta in 1947. This line passes through the important oil areas of Ukhta and Ust' Kozhva. A line from Kotlas connects this Pechora line with the Trans-Siberian Railroad (Plan 23).

The northern terminus of line 8 is on the left bank opposite the city of Arkhangel'sk. Crossing of the Severnaya Dvina is via ferry to Arkhangel'sk except when the river is frozen over, at which time tracks frequently are laid on the ice. A spur line via permanent bridge connects the island Ostrov Solombaskaya with Arkhangel'sk. A branch line provides single-track connection with the port and shipyard area of Molotovsk.

The motive power on this line generally uses wood for fuel except on the electrified sections.

The two known important bridges on this line cross the Volga river at Yaroslavl'. Both of these bridges are double-track; one (No. 3) of unknown type is 1,969 feet long and was being constructed in 1941, the other (No. 208) is a steel through-type truss composed of five 469-foot spans.

9. Murmansk – Leningrad – Tallinn.—This 1,124-mile line connects the ice-free port of Murmansk with the naval base at Tallinn, Estonia. Branch lines at the north connect the naval bases of Polyarnyy and Vayenga. Murmansk is the westernmost port on the Northern Sea Route and the principal import harbor on the north coast. In addition to the import cargo, apatite, nickel, timber, and fish are moved south over the route. At Belomorsk, the northern terminus of the Stalin White Sea – Baltic Canal, a transverse line connects this route with line 8. Other lines connect lines 8 and 9 farther south.

It is reported that in 1947 the line was double-tracked north from Leningrad about 347 miles to Medvezh'ya Gora or 94 miles north of Petrozavodsk, the 1941 end of double-track. The line from Leningrad to Tallinn has been reconstructed as single-track, but in 1941 only about 22 miles within suburban Leningrad was double-tracked.

This route has several sections of electrified line, totaling about 300 miles. Most of this is the 276 miles between Loukhi through Kandalaksha to Murmansk. Except on these electrified sections the motive power is reported to use wood for fuel.

Two lines to the north of Ladozhskoye Ozero (Lake Ladoga) run west from this line and cross the Finnish border. Three other single-track lines run 30 to 40 miles in the direction of, and about half-way to, the border. South of the lake are two lines from Finnish territory which connect with this line at Leningrad. Between Leningrad and Tallinn there are several connecting lines which traverse the annexed Baltic States. Narrow-gage lines meet this section of the line at a couple of places.

There are 11 known bridges over 340 feet long, totaling about 6,420 feet. The longest of these known bridges is (No. 35) across the Volkhov river, east of Leningrad. An important bridge (No. 36) spans the Svir' river, a major link of the Stalin White Sea – Baltic Canal. The re-

ported total length of 686 feet is not definite, but it is a steel double-track structure with a 60-foot center lift span. An old bridge is about 100 yards to the west. The destruction of these bridges would interefere with both water and rail traffic in this important corridor.

Two other fairly long bridges are the single-track structures of unknown design across the Kem' river (No. 344), about 785 feet long, and across the Niva river (No. 345), about 876 feet long. Between Leningrad and Tallinn there are bridge crossings (Nos. 153 and 216) of the Luga and Narva. The steel structures were each about 480 feet long and single-track; both were destroyed in 1944.

10. LENINGRAD – VIL'NYUS – GRODNO.—This trunk line is of great importance and is about 110 miles inland from the Baltic coast. The route crosses two principal generally east – west lines (Nos. 11 and 13) and with two others (Nos. 2 and 12) running in a general northeast – southwest direction, converges on Warsaw, Poland. Little information is available on the line between Ostrov, at the old Latvian border, and Grodno.

In 1941 this 535-mile line was double-tracked except the 220-mile Pskov – Svenvionys section. A 1946 Soviet timetable map indicated that the Leningrad – Pskov and Dukshty (about 30 miles south of Daugavpils) – Grodno sections are being reconstructed to double track. The 191-mile single-track Pskov – Dukshty section is a traffic restriction, but it is somewhat relieved by the single-track line from Pskov to Polotsk where there are two single-track lines providing a connection with line 10 (PLAN 22).

There are at 7 or 8 known bridges 250 to 820 feet long. The longest (No. 135) crosses the Zapadnaya Dvina or Daugava (Latvian) at Daugavpils. This 820-foot highway and double-track railroad bridge was destroyed in July 1944. Data as to its replacement are not available. At Pskov were two bridges; a 328-foot double-track steel structure (No. 212) across the Chereka river was destroyed in 1944, but later information is lacking; the other (No. 213) is a single-track 650-foot steel structure, with semiparabolic trusses on stone piers. This latter bridge across the Vlikaya was destroyed and rebuilt by the Germans in 1944.

11. SMOLENSK – RĪGA.—This 383-mile line through western USSR links Leningrad and Moscow with Rīga, Latvia. Information on the section west of the Latvian border is sketchy. In 1941 the Polotsk-Smolensk section of about 149 miles was completed and the remainder of the line was under construction. The entire line is planned as double-track under the Fourth Five-Year Plan but the status of reconstruction is unknown.

There are six known bridges longer than 250 feet on this line. The longest crosses the Daugava river at Rīga, Latvia. This double-track structure (No. 137) is about 2,438 feet long, accounting for greater length of bridging than the total of the other five bridges. The bridge was destroyed in October 1944, but was reconstructed by the Soviets the next month. One bascule span is about 39 feet long. At or near Vitebsk there are three bridges on line 11, the longest (No. 197) is 785 feet long. The next in length (No. 133) is 535 feet long.

12. BOLOGOYE – VOLKOVYSK.—This 550-mile line from Bologoye on line 1 to the Polish border converges at Siedlce, Poland with line 2. In 1941 it was a double-track line except for the 164-mile Polotsk – Bogdanuv section. A 1946 timetable map indicates that all but the 127-mile Polotsk – Molodechno section was under construction as double-track line as far as Siedlce, Poland.

Seven bridges longer than 250 feet and totaling about 2,625 feet are on this line. Three of the seven, including the longest, are in the vicinity of Polotsk. The longest (No. 103) crossing the Daugava is a single-track, steel semiparabolic truss structure about 768 feet long. There are four equal-length spans and a 417-foot center span. A similar parallel bridge was destroyed in 1944. The other two are northeast of the town and cross the Polota; No. 199 is double-track and 282 feet long, No. 229 is single-track and about 270 feet long.

The second longest bridge (No. 60) across the Neman is about 745 feet long and the second track was being laid in 1942. The bridge was destroyed in 1944. Two parallel bridges across the Volga (56°54′N, 32°46′E) were destroyed and replaced by one single-track bridge.

13. ZHLOBIN – MINSK – KALININGRAD.—This 468-mile trunk line from Kaliningrad (Königsberg, East Prussia) connects that important port with line 10 at Vil'nyus (Wilno), line 12 at Molodechno, line 2 at Minsk, and line 14 at Zhlobin, its eastern end. On the western part of the line there are eight or nine intersecting or branching lines to the north – south. It provides a fairly direct route between Moscow and Kaliningrad via Minsk over line 2. Continuation to the southeast from Zhlobin is via line 14 and its numerous connections.

Detailed information is even scarcer in the area of former East Prussia than the scant information within old Russian territory.

In 1941 the line was double-tracked except on the 186-mile Minsk – Kaunas section, which was single-tracked. The line from Minsk to Kaliningrad is scheduled for double-tracking in the Fourth Five-Year Plan, and according to the Soviet timetable is now completed.

Data are available on only three bridges and one tunnel on this route. The longest bridge (No. 54), a double-track structure of about 1,070 feet across the Nemanus (Neman) and the 4,216-foot double-track tunnel (No. 11) are in the vicinity of Kaunas. This tunnel is the third longest known tunnel in European USSR. The bridge was destroyed by the Germans in July 1944 and rebuilt by the Soviets in the same month. The tunnel was damaged and blocked in 1944. The other long bridge (No. 111) is the 840-foot double-track structure over the Berezina. This bridge, like most bridges in the German occupied areas, was destroyed in 1944.

14. NEVEL' – VITEBSK – ZHLOBIN – KURSK.—This 602-mile trunk line is a part of a continuous route, commencing at Leningrad and maintaining a radius of about 300 miles from Moscow, which makes a semicircle through the southern half of European USSR to Gor'kiy, the intersecting point of lines 7 and 21 on the east of Moscow. This arcked route intersects or connects with 12 strategic routes and many more secondary lines.

Line 14 is to be reconstructed as double-track for its entire length as it was in 1941, according to the 1946 Soviet timetable map. This line and line 3 make double use of the 17 miles of tracks between Bakhmach and Konotop.

There are 12 known bridges totaling about 7,456 feet of bridging, and individual lengths range from about 256 to 1,073 feet. Most of them are double-track or parallel single-track steel structures of various designs and were destroyed either in 1943 or 1944. The two longest bridges are: the 1,073-foot structure (No. 351) across the Desna, and the 1,033-foot bridge (No. 198) across the Zapadnaya Dvina at Vitebsk. North of Vitebsk on this route is a 577-foot structure which also crosses the Zapadnaya Dvina. Other bridges with lengths ranging from 800 to 900 feet are (Nos. 100, 118, and 349), across the Dnepr, and Sozh rivers. Number 100, across the Dnepr, con-

sisted of two single-track, 830-foot steel structures on common piers. Bridges across the Drut' (No. 101) and a Dnepr tributary (No. 236) consist of parallel single-track bridges.

15. BREST – STALINGRAD.—This 1,323-mile trunk line is the longest in European USSR. From Brest it arcs south and east with a radius of about 550 or 600 miles from Moscow, approximately paralleling the arc formed by lines 13 and 14. Line 2 junctions with this line at Brest to connect into the line to Warszawa (Warsaw) where line 10 meets. At Siedlce, between Brest and Warszawa, line 12 extension junctions with this Polish line. En route to the east, line 15 crosses the lines 3 to 6, and at the eastern end intersects line 18 at Stalingrad. This route links the Ukraine, Donbass, and the lower Volga basin to serve as a carrier of agricultural products, coal, metals, and oil.

Under the Fourth Five-Year Plan this entire line is to be double-tracked. In 1941 the line was double-track from Brest to Likhaya (about 1,086 miles), except possibly for a 24-mile stretch between Shepetovka to Mogilyany (immediately east of bridge No. 142) which was single-tracked in 1939.

A 53-mile section of the line between Kazatin I and Fastov in 1947 was double-line with one 5'0"-gage track and one 4'8½"-gage track. This section is also a part of line 3 which is double-line between Kiev and Zhmerinka and thence west via line 16 through L'vov into Poland. At Popel'nya (PLAN 24) between Fastov and Kazatin there is a 2% grade of unknown length and unknown minimum radius of curvature. At Stalingrad there is a 1½% grade. About midway on the (1939) single-track Shepetovka – Mogilyany section there was a minimum radius of curvature of about 656 feet and a 0.9% grade.

The 15-mile Zvehevo – Likhaya section (PLAN 25) is doubly used by lines 6 and 15.

There are 11 known and located bridges longer than 250 feet and totaling about 11,220 feet. The longest are crossings of the Dnepr and Don rivers. Across the Dnepr is a 4,115-foot highway-railroad bridge (No. 356) with double-track railroad lines on the lower deck. Clearance above 20-foot-deep channel is about 39 feet. This bridge was nearly completely destroyed but was repaired in 1943. The Don crossing (No. 21) is 2,336 feet long and single. It is the German replacement of the 2,100-foot single-track bridge (No. 122) which was destroyed by them in 1942. The other bridges range in length from 256 to 990 feet (No. 12 across Severnyy Donets). Three of those crossings consist of parallel single-track bridges: No. 242, across the Goryn', 440 feet; No. 290, over the Ross', 732 and 771 feet; No. 352, crossing Volch'ya, 410 feet long. Bridge crossings over the Ross' and Volch'ya were destroyed in 1944 and 1943, respectively.

A car ferry crossing at Stalingrad connects this line with the Akhtuba – Paromnaya line which junctions with line 19 to provide through-car traffic to Astrakhan'.

16. ODESSA – ZHMERINKA – L'VOV.—This 459-mile route roughly parallels the Dnestr river at distances which vary from about 10 to 50 miles from Odessa to L'vov. It is the trunk line nearest the Rumanian – Hungarian Czechoslovakian border. There are 14 junction points on this line and many of the connecting lines run into the bordering countries. At the important port of Odessa connection is made with the coastal line which connects with all south coast ports from the Rumanian border to Kerch'.

In 1941 the line was double-tracked except the 97-mile single-track Derazhnya – Ternopol' section. The 60-mile line from L'vov to the Polish border makes an uninterrupted route from Germany to Kiev. This section (which is not included in the total length of line 16), line 16 to Zhmerinka, and line 3 into Kiev is a double-line with one track of 5'0" and the other of 4'8½" gage (1947).

There are only two known bridges, one about 270 feet and the other about 375 feet long. Immediately west of the border, however, there is a 610-foot bridge (No. 358) across the San river.

17. BRYANSK – KHAR'KOV.—This 286-mile connecting line is to be reconstructed to double-track line, but the proposed completion date is unknown. It was, except for a few short single-track sections, double-tracked in 1941. Between Navlya and Bryansk the line is part of strategic route 3 into Moscow. North of Bryansk there is a single-track line which runs almost due north to connect with line 1.

Nine known bridges totaling about 3,495 feet are on this short line. The 879-foot double-track bridge (No. 260) across the Seym, located just below the junction of lines 14 and 17, was destroyed in February 1943. The other eight shorter bridges are fairly well distributed along the line.

The maximum grade is 0.84% on the Gotnya – Lgov section. Along this section is also located the minimum radius of curvature of about 722 feet.

18. GRYAZI – STALINGRAD – ROSTOV.—This 733-mile single-track line connects the important industrial city and inland port of Stalingrad with Moscow via Gryazi, and with Rostov and the Caucasus. Over this line is borne the transit commodities of the Volga, oil, lumber, and grain, and the products of the Stalingrad industries. In 1947 there had been no improvement to double-track line.

Line 18 junctions with line 6 at Gryazi, and intersects line 21 en route to Stalingrad where it junctions with line 15. A ferry at Stalingrad provides connection with the Akhtuba – Paromnaya railroad on the east side of the Volga river.

There are at least 10 bridges that are 250 feet or more long totaling 7,964 feet. The two longest are each about 1,640 feet long. The one across the Don tributary (No. 23) is a single-track reinforced arch bridge. The other (No. 224) is a highway and single-track railroad bridge across the Cheprak (Karycheplsk). At Rostov-na-Donu there is a 1,115-foot bridge (No. 123) which carried double-tracks but it was destroyed in 1942. Another bridge across the Don river at Rostov (No. 338) was 971-foot double-track structure which was destroyed in December 1942. A replacement erected on a spur line also was subsequently destroyed. The 909-foot structure (No. 24) across the Medveditsa is single-track, steel, through lattice truss type. The other bridges, of which several are concrete, range from 322 to 699 feet long.

19. MICHURINSK – SARATOV – ASTRAKHAN'.—This eastern link of Moscow via line 6 with central USSR, the lower Volga and the Caucasus is about 691 miles long between Michurinsk and Astrakhan'. The principal commodities carried are grain, coal, pig iron, machines, and oil. Besides the industries of Astrakhan' and Saratov, the salt refineries at Verkhniy Baskunchak and El'ton originate an important traffic item of this line. The large fishing industry of the Caspian Sea and Astrakhan' ship considerable freight over this route.

In 1941 only the Michurinsk – Saratov section of about 280 miles was partly double-track, and the remainder was single-track. According to the 1946 Soviet timetable map

the 280-mile section was 75% completed as a double-track line; no other information is available.

There are five known bridges on this line totaling 14,590 feet of structures. The longest bridge (No. 181) is about 5,520 feet long across the Volga river below Saratov. It is single-track and built in 1934-35. Three single-track bridges (Nos. 27, 28, and 29) span the Akhtuba, Buzan, and Bol'shaya Bolda in that order and are respectively 1,558, 1,400, and 2,884 feet long. It is known that the 1,400-foot bridge (No. 28) has a movable 60-foot span, but specific data on the others are unknown. In addition to those three structures in the Volga delta, there are 11 other bridges varying from 174 to 420 feet long and totaling about 3,890 feet.

During World War II there was a car ferry in operation at Astrakhan' for crossing the Volga, but its present status is unknown.

20. Ryazan' – Kuybyshev – Ufa.—This 862-mile trunk line (about 646 miles in European USSR) will form a part of the South Trans-Siberian Railroad line which is proposed to junction with line 20 at Kuybyshev. It is an important line linking Moscow via line 6 with the middle Volga river area and the south Urals.

In 1941 the 452-mile Ryazan' – Syzran' section was single-track with the second track under construction, but the 1946 Soviet timetable map indicates some change. The timetable shows: Ryazan' – Ruzayevka, 260 miles, single-track; Ruzayevka – Syzran', 191 miles, partially double-track; Syzran' – Ufa, 411 miles, double-track.

On the European USSR part of the line there are five known bridges longer than 561 feet and totaling about 7,620 feet. The considerably longest bridge is the double-track structure (No. 180) spanning the Volga past Batraki, the river port a few miles upstream from Syzran'. This bridge is about 4,885 feet long and is double-track. It was constructed in 1880 with 13 equal-length spans of steel through-type parallel chord trusses on stone piers. The first 2 trusses on the left bank were blown up in 1919 and subsequently replaced with semiparabolic trusses.

The other four known bridges in the area range from 561 feet to 839 feet long. The 839-foot bridge (No. 16) is a single-track steel structure across the Tsna river.

At Ufa, outside the European USSR area are two long bridges; No. 326 across the Belaya is double-track and 2,149 feet long; No. 327, east of Ufa and spanning the Ufa river, is an 853-foot single track structure.

The maximum grade on this line is 1%, but it is noted that the line rises about 820 feet above sea level at Kadoshkino (Plan 25) about 54°00'N and 44°26'E.

21. Kursk – Voronezh – Gor'kiy.—This 877-mile line is the last of the selected strategic railroad routes. It has been discussed briefly as the eastern part of the 240 degree arc from Leningrad through the south to Gor'kiy with a radius of about 250 miles from Moscow (Plans 22 to 25). The strategic lines 14 and 21 are shown on Figure I-11, but the mostly single-track line north from Nevel' to Leningrad appears only on Plan 22. Line 21 of the arc connects the important industrial and mining areas of Kursk and Voronezh with railroads to Stalingrad and the lower Volga, as well as with all three lines from Moscow to the Urals.

In 1941 the 410-mile Voronezh – Penza section was double-track line, and the remainder was single-track. According to the 1946 timetable only the sections Voronezh – Liski (Svoboda) – Povorino, about 195 miles, were reconstructed to the 1941 double-track status. (About 55 miles, Voronezh – Liski, is jointly used by lines 6 and 21.) Apparently there is no other change on the line.

Only two bridges of any great length are noted on the line. One (No. 120) across the Don is about 865 feet long. The original 3-span structure was destroyed in 1943 and the Soviets replaced it with a steel single-track structure composed of 4 equal-length through-trusses totaling about 578 feet and 5 equal-length deck-plate girders totaling about 287 feet. The other bridge (No. 184) is also near Voronezh, single-track, and about 440 feet long.

(d) Operation and traffic.—The distribution of operating supplies, maintenance and construction materials consumes a considerable portion of the traffic capacity of the USSR railroads. In order to meet the planned expansion and improvement goals this self-consumed capacity will continue for some time.

1. Supply

a. Fuel.—The principal fuels are coal, oil, and wood in European USSR. Some lignite and peat is utilized, but main line operation relies upon the principal fuels.

Suitable railroad coal is available in only a few places among the numerous coal deposits and about 60% of the railroad coal is mined in the Donbass. Distribution of this fuel requires long hauls, and the railroad authorities have been endeavoring to secure supplies of coal which are more equalized with the location of operation requirements. In 1937 about 48 million short tons, or 37% of all coal hauled, was consumed by the railroad system and involved hauls varying (1939) from 746 to 1,846 miles.

Petroleum, the second most important fuel, is used in both steam and diesel locomotives. In 1937 about 2,095,000 short tons of oil were used principally in the diesel equipment with only a small amount in oil-fired steam locomotives. About 12% of the total national consumption was railroad fuel, and required hauls as long as 1,243 miles with more than half of the oil carried 497 miles.

Wood is used as fuel on at least two lines, Murmansk – Leningrad and Moscow – Arkhangel'sk on the nonelectrified sections. The connecting line, Belomorsk – Obozerskaya, probably used wood as the primary fuel. Other lines in the forested regions of European USSR probably utilize wood but data are not available on them or the amount consumed by the two main and connecting lines.

b. Water.—An adequate supply of water is usually available in the most important and densely built-up areas, but in some regions, such as the northern Caucasus, both the quality and quantity are poor. In the northern part of European USSR the low temperatures have an adverse effect on the water supply. Treatment of water is controlled to preclude deleterious action on the boilers and cooling systems. Because of German destruction there are some remaining difficulties with the water supply systems and stations in the war-ravaged areas, even in the more densely populated areas.

c. Maintenance and construction.—The three major items of timber, steel, and ballast constitute a high percentage of all freight hauled. In European USSR the war-devastated areas are particularly burdened with reconstruction freight requirements. To handle the bill-of-material for 13,000 bridges, totaling about 186 miles, alone will require considerable traffic space. The ballasting of 9,300 miles of single track by 1950 with six inches of crushed stone will require about 30 million short tons of material. In 1946 about 6.2 million ties were brought into the USSR from Germany. Those ties amounted to about 400,000 short tons and a little more than one-fifth

of the total tie requirements for the year. The laying of 31,070 miles of new rail during the Fourth Five-Year Plan implies the movement of new rail and accessories amounting to 5.5 million short tons. Premised on those figures, an average of about 8 million tons of track and ballast material will have to be transported each year of the current Plan. In addition to that calculable tonnage, material for rehabilitation and construction of bridges and other structures, terminals and stations, shops, locomotives, and rolling stock will amount to a tremendous volume of self-consumed railroad freight. The location of accessible resources and manufacturing plants mostly in European USSR results in the fact that most of this tonnage originates in and must be transported in and through the area.

2. EFFECT OF WEATHER.—The climate of European USSR is characterized by severe, long winters and moderate, short summers. The area is approximately between the same latitudes as the North American continent from the Great Lakes to the Arctic coast of Canada. The climate, however, is not so severe as that of an equivalent latitude of the North American area.

During the winter months the entire area has below freezing temperature. In the northern part the mean is below freezing for about six months of the year, but the severest winters are experienced in the northwest interior, away from water areas. As a result of these low temperatures winter operation of steam motive power is especially inefficient on the northern lines. A considerable part of the Leningrad – Murmansk line is electrified and that eliminates part of the line efficiency loss. Freezing of switches and water supply slow operations, but the drifting of snow is the worst effect of winter. Restricting the nearness of structures to the lines, placing of wind breaks, and elevating the lines above the surrounding tundra have reduced the blocking of lines by drifting snow.

The solidly frozen sand-ballast roadbed is injurious to the equipment and rails, and spring thawing, especially on the Murmansk line, so unstabilizes the roadbed that slow operation is required. Maintenance of drainage ditches is a serious problem along some sections because the soil becomes a semifluid mass incapable of holding and regular shape. Although sometimes ten feet deep, the ditches are frequently inadequate to carry the peak spring flow.

The effect of rigorous cold on lubricants has been offset by a small volume but extremely important petroleum product. Waste axle and cylinder oil are mixed with "Solaroil," a light yellow liquid obtained as an end product from crude oil. "Solaroil" has a viscosity of 1.2 to 1.9 degrees on the Engler scale and a freezing point of minus 50 to 60 degrees.

3. TRAFFIC.—The railroads are the overburdened arteries of traffic in European USSR for long distance movement. Although considerable bulk commodities are carried by coastwise and inland water shipping, delivery to final destination is generally by railroad. A large factor which causes this burden is an unbalanced distribution of freight load, the dearth of motor vehicles, and inadequate highways for other than local distribution in the larger centers.

a. Freight.—A characteristic feature of the railroad freight traffic is that north – south traffic is much heavier than the east – west traffic, but the domination of satellite countries on the west will affect this pattern. Coal, iron, and steel are moved north from the Donets and Dnepr areas to the heavy industries of central European USSR, Moscow and Leningrad. On the other hand timber from the north is carried to the southern Ukrainian steppes. The Ukrainian SSR is the area of the highest traffic density, with the Donbass network handling about 25% of the total USSR railroad freight in 1937. In the whole USSR in 1937 about 570 million short tons of freight was originated and about three-fourths of this was originated in and destined for areas of European USSR. Of this European USSR freight, the Southern area which includes the rich Donbass originated about 42% while only about 30% was destined for the area. The North and Upper Volga originated around 15%, about 1% more than received. The Southwestern area originated about 14% and received about 16%. The Northwestern origins amounted to about 10% while receiving about 16%, and the Central area originated a little less than 12% but received 18 percent. The Lower Volga had only a fractional difference between origin and destination freight, both amounting to between 6 and 7 percent.

In 1940 the total freight traffic of the USSR amounted to about 285 billion short ton-miles; the planned traffic for 1941 was about 10 billion increase, and that for 1950 is about 364 billion short ton-miles. Coupled with this planned increase of traffic is an attempt to increase the amount of freight but to reduce the undesirable growth of the length of haul. Despite concerted efforts commencing with the First Five-Year Plan, the average length of haul has steadily increased. Between 1928 and 1940 the amount of originated freight increased 3.8 times, but the ton-miles increased by 4.4 times and the length of haul was increased by about 17 percent. Part of the USSR difficulty is in the growing pains of the industrial development with industries at places far from the consuming centers, and newly discovered raw materials in the outlying areas of the country. In the program for 1946-1950 emphasis is placed on the development of local industry and the opening of local mines and quarries, which will contribute to reduction of the length of the average haul so that an average of not more than 429 to 430 miles may be attained.

Despite the planned betterment of the equipment inventory, the announced goal of 846 million short tons of originated freight in 1950 (about 97% more than 1945) can be met only by a tremendous increase of daily car loadings and some increase of the average load per car, as well as shortening of the haul. The 1945 daily car loadings was about 61,400 with an average load of 17.6 short tons, and the Plan calls for 115,000 loadings with an average load of 20.2 short tons for 1950. There is no explanation of why car loadings in 1945 was about 40% below the prewar daily average when industrial output was reported only about 10% less. In any case carloadings for 1946 were 11% greater than 1945, but the planned quota for the first quarter of 1947 was underfilled. Operations for the second quarter reflected recovery as did all reported aspects of railroading, but the performance had not compensated for the setback of the first quarter.

Almost three-quarters of Soviet freight consists of six bulk items which in 1938 were divided for the whole USSR as follow: coal and coke 26%, wood 14%, oil 10%, grain 8%, iron 7%, and mineral building materials 4 percent.

b. Passenger.—The passenger traffic has been forcibly reduced in order to allow for greater increase of freight traffic, but even with maximum utilization of passenger equipment, the capacity is inadequate for the needs of the country. The government has promised to improve passenger traffic facilities during the Fourth Five-Year Plan to an announced goal of 2 billion passengers

and with an increased number of long-distance trains. Restrictions on passenger service show clearly in the decrease in the number of passengers: 303 millions in 1932 decreased to only 274 millions in 1937. The average passenger trip was decreased from 85 miles in 1913 to 50 miles in 1939. Despite the restrictions on passenger traffic the Soviet railroads haul more passengers than the railroads in the United States. A tremendous number of passengers are hauled on Soviet railroads because there is inadequate motor transportation. A comparison of the USSR and the United States for 1937 is:

	USSR	U.S.
Number of passengers carried (millions):		
Suburban	869.3	245.8
Long distance	273.4	251.5
Total	1,142.7	497.3
Average haul (miles)	49.7	49.6
Total passenger miles (billions)	47.5	24.7
Average number of trips per person per year:		
Suburban	5.3	1.9
Long distance	1.7	1.9
Total	7.0	3.8

TABLE I – 6

SELECTED STRATEGIC RAILROADS, EUROPEAN USSR

(Reference: FIGURE I–11)

	1 Moscow – Leningrad	2 Moscow – Minsk – Brest	3 Moscow – Kiev – Zhmerinka	4 Moscow – Khar'kov – Sevastopol'	5 Moscow – Yelets – Taganrog – Rostov
Length of route....miles..	404	668	700	933	817.
Percent of grade (and location).	0.5 to 0.6 (Tosno-Chudovo).	No data	2.0 (Popyel'nya)	1.25 (Sevastopol' – Simferopol'). 0.8 (Simferopol'–Kursk)	1.0 (Debal'tsevo–Valuyki).
Minimum radius of curvature (and location) feet..	No data	....do	722 (Kazatin – Kalinovka). 794 (Brovki, 75 mi.W of Fastov) 738 (Chernorudka, 85 mi. W of Fastov).	984 (Sevastopol' – Simferopol'). 2,100 (Simferopol'–Kursk).	1,394 (Debal'tsevo – Valuyki).
Maximum spacing of ties (and location) on line track.....inches..	22.4 (Tosno – Chudovo).	....do	15.7 (Navlya – Konotop)	No data	No data.
on bridges.....inches..	No data	17.7 (Smolensk – Borisov). 25.6 (Orsha – Lepel branch).	16.7 (Kiev – Nezhin) 19.7 (Nezhin – Priluki branch). 23.6 (Kiev – Koresten' branch).	17.7 (Belgorod – Khar'kov).	Do.
Rail weight (and location) lb/yd..	88 (Tosno – Chudovo).	No data	No data	No data	Do.
Maximum permissible axle load on bridges (and location).....short tons..	22.0 to 25.3	....do	22	22 (Moscow – Aprelevka) 17.6 (Sevastopol')	17.6 (Debal'tsevo – Valuyki).
Electrified sections.miles..	40.4 (Moscow – Podsolnechaya).	8.7 (Moscow–Setun, operating). 18.6 (Setun – Golitsyno, projected).	26.1 (Moscow – Aprelevka).	39.8 (Sinel'nikovo – Zaporozh'ye). 26.7 (Moscow – Podol'sk) 8.1 (Podol'sk – L'vovskayo, projected).	23 (Moscow – Domodedevo).
Stations:					
Number	88	132	166	189	134.
Distance between stations.....miles..	4.6 average	5.1 average	4.2 average; 15.5 maximum.	5.0 average; 15.5 maximum.	6.1 average.
Number of:					
Junctions	12	8	13	15	14.
Fuel stations	3	5	13	3	4.
Water stations	8	15	32	37	21.
Locomotive depots	7	No data	7	8	No data.
Locomotive sheds	4	10	8	8	2.
Car repair shops	7	8	19	2	No data.
Terminal yards	7	3	12	17	9.
Speed of trains..miles/hr..	No data	29.8	15	24.9	No data.
Remarks	Fastest trains in USSR, up to 43.5 miles an hour. This line has automatic block signals.	Main route to Poland and Germany. Southwest section crosses Pripet Marshes.	One track of 4'8½'' gage and one of 5'0'' gage form double line from Kiev to Zhmerinka to junction with double line 16 through L'vov into Poland.	5 tunnels and 2 bridges immediately outside Sevastopol', the principal naval base of the Black Sea Fleet. From Zoporozh'ye through Dolgintsevo an electrified 162-mile line connects with Line 15 at Pyatikhatki.	Provides direct route through Donbass to Caucasus through Rostov.

TABLE I – 6 (Continued)

	6 Moscow – Ryazan' – Rostov	7 Moscow – Gor'kiy – Molotov	8 Moscow – Vologda – Arkhangel'sk	9 Murmansk – Leningrad – Tallinn	10 Leningrad – Vil'nyus – Grodno
Length of route....miles..	762.....	844.....	703.....	1,124.....	535.
Percent of grade (and location).	1.0 (Voronezh – Michurinsk and Kamenolomny – Novocherkassk).	0.6 (Moscow–Gor'kiy). 0.72 on tangents (Gor'kiy– Kotel'nich). 0.6 on curves with 2,100-foot radius or less (Gor'kiy – Kotel'nich).	0.8 (Vologda–Arkhangel'sk).	0.6 (Volkhovstroy–Petrozavodsk). 1.4 (Petrozavodsk – Murmansk).	0.6 (Leningrad – Pskov.
Minimum radius of curvature (and location) feet..	1,739 (Voronezh – Michurinsk).	1,739 (Gor'kiy – Kotel'nich). 3,281 (Moscow – Gor'kiy).	999 (Vologda–Arkhangel'sk).	1,394 (Volkhovstroy – Petrozavodsk). 1,050 (Petrozavodsk – Murmansk). 2,100 (Leningrad – Volkhovstroy).	971 (Leningrad – Pskov).
Maximum spacing of ties (and location) on line track.....inches..	No data.....	No data.....	(2,100 to 2,250 ties per mile).	(2,100 to 2,250 ties per mile).	27.6 (Leningrad – Gatchina).
on bridges.....inches..	....do.....	....do.....	....do.....	....do.....	No data.
Rail weight (and location) lb/yd..	....do.....	....do.....	60.5 to 64.5.....	60.5 to 64.5.....	62.3 to 87.8 (Leningrad – Gatchina).
Maximum permissible axle load on bridges (and location).....short tons..	22 (Moscow – Ryazhsk). 17.6 (Ryazhsk – Rostov).	17.6 (Moscow–Gor'kiy) 22 (Gor'kiy – Kotel'nich)	22.....	22.....	19.8 (Leningrad – Gatchina).
Electrified sections miles..	27.3 (Moscow – Romenskoye).	14.9 (Moscow – Zheleznodorozhnyy).	70.2 (Moscow–Aleksandrov). 32.3 (Arkhangel'sk–Molotovsk).	276 Murmansk – Kandalaksha – Loukhi. 14 (Apatity – Kirovsk, branch). 7 (Tallinn–Pääsküla).	28.6 (Leningrad – Gatchina).
Stations:					
Number.....	115.....	146.....	118.....	159.....	81.
Distance between stations.....miles..	6.1 average; 9.9 maximum (Michurinsk – Voronezh); 14.3 maximum.	5.8 average; 14.9 maximum (Moscow – Kotel'nich).	6.0 average; 12.4 maximum.	7.1 average; 12.4 maximum.	6.7 average.
Number of:					
Junctions.....	13.....	10.....	7.....	17.....	18.
Fuel stations.....	1.....	No data.....	No data.....	No data.....	No data.
Water stations.....	21.....	39.....	11.....	42.....	11.
Locomotive depots.....	11.....	8.....	6.....	11.....	4.
Locomotive sheds.....	16.....	8.....	4.....	10.....	No data.
Car repair shops.....	9.....	1.....	1.....	3.....	2.
Terminal yards.....	19 (many smaller ones).	12.....	4.....	11.....	No data.
Speed of trains..miles/hr..	No data.....	No data.....	No data.....	No data.....	Do.
Remarks.....	Direct route to Caucasus through Rostov.	About 780 miles in European USSR. Northern route of the trans-Siberian railroad.	Wood fuel except on electrified sections. Line to the Pechora resources branches at Konosha.	Grades probably reduced on Petrozavodsk – Murmansk section. Wood fuel except on electrified section.	Sand ballast Leningrad – Gatchina.

TABLE I – 6 (Continued)

	11 Smolensk – Polotsk – Rīga	12 Bologoye – Polotsk – Volkovysk	13 Zhlobin – Minsk – Kalingrad	14 Nevel' – Vitebsk – Zhlobin – Kursk	15 Brest – Stalingrad
Length of miles....miles..	383	550	468	602	1,323.
Percent of grade (and location).	No data	No data	No data	0.7 (at Nezhin) 0.8 (Konotop–L'govskiy).	2.0 (at Popel'nya). 1.5 (at Stalingrad). 1.0 (Mironovka–Fastov) Krivomuzginskaya – Stalingrad. 0.9 (Brest – Kovel', Shepetovka – Kazatin). 0.8 (Berdichev – Brovki, Tsvetkovo – Mironovka, Likhaya – Krivomuzginskaya).
Minimum radius of curvature (and location) .feet..	....do	....do	....do	No data	656 (near Shepetovka between Baran'ye – Krivin). 699 (Mironovka – Tsvetkovo). 738 (Shepetovka – Kazatin). 820 (near Popel'nya). 965 (Kazatin – Brovki). 1,050 (Krivomuzginskaya – Stalingrad). 1,148 (Fastov – Mironovka). 1,739 (Likhaya – Krivomuzginskaya). 2,100 (Kovel' – Brest).
Maximum spacing of ties (and location) on line track.....inches..	No data	13.8 (Bologoye – Toropets). 23.6 (Polotsk – Molodechno).	....do	....do	No data.
on bridges.....inches..	....do	7.9 (Polotsk–Molodechno). 15.7 (Velikiye Luki – Kun'ya branch). 17.7 (Bologoye – Staraya Russa branch).	....do	13.8 (Vitebsk – Orsha).	Do.
Rail weight (and location) lb/yd..	....do	No data	....do	No data	Do.
Maximum permissible axle load on bridges (and location).....short tons..	No data	....do	....do	....do	22 (Likhaya – Stalingrad).
Electrified sections. miles..	None	None	None	None	77.7 (Pyatikhatki – Nishne – Dnepropetrovsk). A line, Pyatikhatki – Dolgintsevo – Zaporozh'ye, about 160 miles, connects with line 4.
Stations:					
Number	55	66	82	91	165.
Distance between stations.....miles..	7.1 average	8.5 average	5.8 average	6.7 average	8.1 average; 10.0 maximum (Likhaya – Stalingrad).
Number of:					
Junctions	8	11	14	13	31.
Fuel stations	2	2	3	6	14.
Water stations	13	5	12	36 (Nevel'–Gomel', nearly all stations).	55.
Locomotive depots	3	1	2	10	10.
Locomotive sheds	3	1	6	6	17.
Car repair shops	8	1	3	8	15.
Terminal yards	2	No data	4	6	13.
Speed of trains. .miles/hr..	37.3 express, 24.9 local (Smolensk – Vitebsk) 31.7 express (Vitebsk – Polotsk).	No data	No data	No data	No data.
Remarks					R.R. Ferry at Stalingrad to cross the Volga river.

TABLE I – 6 (Continued)

	16 Odessa – Zhmerinka – L'vov	17 Bryansk – Khar'kov	18 Gryazi – Stalingrad – Rostov	19 Michurinsk – Saratov – Astrakhan'	20 Ryazan' – Kuybyshev – Ufa	21 Kursk – Voronezh – Gor'kiy
Length of route....miles..	459.....	286.....	733.....	691.....	862.....	877.
Percent of grade (and location).	1.0 (near Odessa) 0.97 (Podol'skiy Post – Derazhnya). 0.81 (Grechany – Volochisk).	0.84 (Gotnya – Lgov).	0.8 (Gryazi – Stalingrad).	1.0 (Tambov – Saratov at place just W of Saratov). 0.8 (Michurinsk – Tambov and Saratov – Astrakhan').	1.0 (Ryazan' – Ruzayevka and Chishmy – Ufa). 0.8 (Ruzayevka – Chishmy).	1.0 (Gor'kiy – Kud'ma). 0.8 (Kud'ma – Krasnyy Uzel and Ruzayevka – Liski). 0.7 (Krasnyy Uzel – Ruzayevka).
Minimum radius of curvature (and location) feet..	2,357 (near Odessa). 1,702 (Derazhnya – Proskurov). 1,312 (Grechany – Volochisk).	722 (Gotnya – Lgov).	1,739 (Gryazi – Stalingrad).	1,739 (all sections so far as known).	1,394 (Ryazan' – Ruzayevka). 1,739 (Ruzayevka – Chishmy).	869 (Gor'kiy – Kud'ma). 1,394 (Krasnyy Uzel – Ruzayevka). 1,739 (Kud'ma – Krasnyy Uzel and Ruzayevka – Liski).
Maximum spacing of ties (and location) on line track.....inches..	No data.....	No data.....	No data.....	No data.....	No data.....	No data.
on bridges.....inches..	9.5 (Khristinovko – Tsvetkovo branch).	....do.....	....do.....	....do.....	....do.....	Do.
Rail weight (and location) lb/yd..	67.5 (Odessa – Razdel'naya).	....do.....	....do.....	....do.....	....do.....	Do.
Maximum permissible axle load on bridges (and location).....short tons..	19.8.....	....do.....	17.6.....	17.6 (Michurinsk – Saratov). 22.0 (Urbakh – Astrakhan').	17.6 (Ryazan' – Ruzayevka, Chishmy – Ufa). 22.0 (Ruzayevka – Chishmy).	17.6 (Liski – Krasnyy Uzel). 22.0 (Krasnyy Uzel – Gor'kiy).
Electrified sections.miles..	None.....	None.....	None.....	None.....	6.8 (Kuybyshev – Bezymyanka).	None.
Stations:						
Number.....	73.....	67.....	91.....	103.....	148.....	122.
Distance between stations.....miles..	6.0 average....	4.3.....	8.1 average; 13.7 maximum.	6.7 average; 22.4 maximum on Saratov – Astrakhan'.	5.9 average; 16.8 maximum.	7.2 average; 11.2 maximum.
Number of:						
Junctions.....	14.....	13.....	6.....	14.....	9.....	14.
Fuel stations.....	6.....	7.....	No data.....	1.....	No data.....	2.
Water stations.....	22.....	11.....	16.....	16.....	17.....	27.
Locomotive depots.....	7.....	4.....	6.....	5.....	9.....	9.
Locomotive sheds.....	5.....	5.....	4.....	7.....	9.....	7.
Car repair shops.....	6.....	2.....	1.....	2.....	1.....	5.
Terminal yards.....	1.....	5.....	6.....	9.....	8.....	12.
Speed of trains..miles/hr..	25 average and 34 maximum at Odessa with 940 ton loaded train.	12.5 to 15.5 average.	No data.....	No data.....	No data.....	No data.
Remarks.....	.....	.....	R.R. ferry at Stalingrad to cross the Volga river.	R.R. ferry across Volga during World War II.	About 646 miles of the line are in European USSR.	.....

(2) Roads

(a) General

1. DEVELOPMENT.—The Soviet Union inherited from the Tsarist regime only a few disconnected stretches of relatively good highways. The belief that poor roads were a barrier to military aggression deterred road building, and the few existing roads were constructed for either political or limited military purposes. During the Revolution and the early years of the reconstruction period the few existing roads were allowed to deteriorate. When the USSR began to industrialize in the mid-twenties, the roads,

scarcely a network, were uncoordinated and badly in need of repair.

Although the New Economic Policy recognized the need for better roads, highways were relegated to third importance in the forms of transportation which, as a whole, was placed secondary to the development of heavy industry. Another retarding element undoubtedly was the slow development of the automotive industry. Most road building of modern type was accomplished after 1917, but by March 1941 the road system was inadequate and for the entire USSR totaled about 1,042,000 miles. (Data are not available for European USSR separate from the remainder of the country.) Of this total only 60,000 miles, or about 6%, consisted of hard-surfaced roads; 112,000 miles, about 11%, of improved dirt roads; the remainder or 870,000 miles, about 83%, were unimproved dirt roads. The mileage of all roads in the USSR was about 30% of that in the United States, though spread over an area three times as large. The Soviet Union has about 1 mile of surfaced road per 1,000 square miles of area in contrast to about 400 miles in the United States. Shortages of trained personnel, equipment, and material have contributed to the inadequate development of roads in the USSR. There are some indications that the importance of good roads was recognized during World War II, and the postwar period may show more progress in road development. The critical need of ballast material for the railroads, which has preference over stone for highway construction, is only one of the many obstructions that will slow highway development. These many deficiencies will delay development of a road network to equal that in the United States in the thirties.

2. ADMINISTRATION.—The responsibility for the administration and maintenance of all important highways has been with the Ministry of Internal Affairs (MVD) since April 1946. Subordinate to the central administration are *oblast* and *rayon* main transport agencies. The basic production units responsible for the maintenance of roads are the exploitation sections, rayon sections, and local road administrations. The major source of manpower is forced labor controlled by MVD, but the local rural population is also required to contribute labor, tools, and draft animals for six days each year without compensation.

3. PATTERN OF ROAD NETWORK.—In 1947 the principal road net of European USSR consisted of a few spokes radiating from Moscow to Leningrad, the Baltic States, and the European border, and one or two others to the south and east for varying distances. At railheads, navigation heads of inland waterways, and ports there were some short feeder roads but mostly uncoordinated with the roads from Moscow (FIGURE I-11 and PLANS 22 to 25).

The Moscow – Leningrad road is the only through all-weather route from the capital to the borders or to any of the sea ports. Many areas are without any improved roads. In other areas, the existing routes are motorable only in dry weather or when unrutted and frozen. Although of very low type, the existing roads are extremely important both economically and militarily.

a. Moscow area (PLANS 22–25).—Moscow is the hub of 11 all-weather and 3 mostly-all-weather radial roads of various lengths. These roads provide the nucleus for a good highway network focused on Moscow. The 11 all-weather roads have either concrete or bituminous surfaces. The highways, arbitrarily assigned numbers for mechanics of discussion, are shown on the maps of the Strategic Transportation System (FIGURE I-11), and on the General Transportation Systems (PLANS 22 to 25). The four longest routes are:

ROUTE	LENGTH IN MILES
1, Moscow - Minsk	430
2, Moscow - Leningrad	450
3, Moscow - Shcherbakov	201
4, Moscow - Gor'kiy	260

Belt highways were planned to encircle Moscow, but little information is available on the construction progress. The one belt route partially encircles Moscow starting at Ruza and running clockwise for about 145 miles to Zagorsk with a radius of about 45 miles. A road from Zagorsk, also mostly all-weather, to Aleksandrov connects with a road that leads to the south to a junction, about 50 miles from Moscow on the road to Ryazan'. There is no information of a road through the southern arc to connect with Ruza.

b. Northwest sector (PLAN 22).—This sector embraces the near-barren annexed Finnish territories and the climatically severe northwestern Karelia and Kola of European USSR, the Leningrad area, the Baltic States and former East Prussia. Between the Barents Sea and Leningrad there are only a few short stretches of roads to the west from the Murmansk – Leningrad railroad. Most of these roads in Karelia and Kola were constructed during the Finnish-Russian War of 1939–40, and are classed as improved, dirt, ice, and winter roads. The improved roads are graded and some are stabilized with field or broken stone, but none have all-weather surfacing for wheeled vehicles. Tracked and runner vehicles are practical and much used in the area for winter transportation. The frozen snow crust frequently provides a trafficable surface on roads and swamps, and ice roads may be used by wheeled vehicles.

Prior to World War II the Baltic States individually launched extensive bridge building programs and their all-weather roads have almost exclusively concrete and masonry bridges. The importance of these three republics to the USSR will probably result in considerable development of highways.

Estonia has a network of all-weather roads focused on Tallinn from Tartu, Viljandi, Valga, Pärnu, and Haapsalu. These roads continue on to connect with the surrounding area networks. The all-weather Tallinn – Leningrad road is either concrete or bituminous surface as far as Narva. Estonia has large supplies of limestone close to ground surface for road building.

Latvia has a road pattern of a triangle, Rīga – Daugavpils – Pskov, formed by three all-weather roads which roughly follow railroad lines. Other roads, but of lower type, cross or branch from these roads to form a fair network so that no place is more distant than about 20 miles from a fair (although some are seasonal) road.

Lithuania had about 1,240 miles of all-weather roads prior to World War II, but reliable information is not available on individual routes. Several of these routes connected with the roads in the Kaliningrad (formerly Königsberg, East Prussia) area and thence into Poland, and to the White Russian network.

Leningrad, although the capital of Russia for 203 years, relied almost entirely upon barges and the canal system in summer and sleds and the frozen waterways and roads during 140 to 160 days of winter for communication with the interior. Some road building was done under the tsarist regime to connect Leningrad with important towns in central and western Russia, but none compared with the better roads of other European countries. Since 1917

better roads have been constructed and possibly the best system is in the relatively short Baltic coastal strip toward Tallinn, Estonia. The best road is the Moscow – Leningrad route, but other all-weather roads lead to Ladoga (possibly Lodenoye Pole), Luga with forks to Staraya Russa and Pskov, and Tallinn. From Lodenoye Pole an all-weather road to the east connects with Vytegra. The southern and western roads connect into the sparse nets of the contiguous areas.

Several lower type roads lead to the northwestward from Leningrad for a few miles into the former Finnish territory.

c. The Northeast sector (PLAN 23).—In this sector are the Moscow – Shcherbakov and Moscow – Gor'kiy roads with only a scattered few surfaced roads connecting them and other points close in to Moscow. North of Vologda there are only dirt roads. Utility of these chiefly ungraded and local roads depends upon the season and type of soil. Roads of this area are seldom dry enough for traffic before July, and the rains commence in September. The winter period makes them more trafficable. By October the roads are sufficiently frozen for traffic which may continue until the spring thaw. Impediments to efficient winter use consist primarily of the huge snow drifts, frozen ruts, and the extreme shortness of daylight.

d. Southwest sector (PLAN 24).—The Ukraine including the rich Donbass, Crimea, and White Russian SSR, are considered in this portion of the network. The Donbass could be considered in the southeast quadrant as well.

The all-weather route Moscow – Minsk and thence mostly all-weather into Brest is the base route of White Russian SSR roads. It is patterned after the German "Autobahnen" but is not the equivalent. The thin system of feeder roads in the area are focused on Minsk, Brest, and Vitebsk. The Pripet Marshes are a formidable barrier to road transportation on the low-type roads during thaws and rainy seasons. Winter freeze, of course, improves the trafficability of these roads. There are large gaps between the White Russian roadnet and the former Polish territory.

The Ukrainian network is densest in its western part and the general pattern consists of radial roads emanating from the more important centers, of which Kiev and L'vov are most important road junction points. In this area there are active military highway construction projects starting along the general line Korosten' – Zhitomir – Berdichev – Kamenets – Podol'skiy, and leading to the 1939 Polish border. East of 31° E longitude, improved roads are rare except around Khar'kov and in the Donets mining region. Even the through routes have little value, except local, because of lack of surfacing and unstabilized bases.

Routes 6 and 6A, Moscow – Sevastopol' and Rostov-na-Donu, consists of some paved sections but from Khar'kov to a midpoint of the Crimea peninsula and Khar'kov to Rostov, the road is in part dirt and subject to seasonal trafficability.

e. Southeast sector (PLAN 25).—In this Volga valley region from Gor'kiy to the river mouth there is no network of any extent. Short sections of all-weather roads are feeder roads to the railroads or connections between stations and river ports. One road along the west bank of the Volga extends from Astrakhan' to Kazan' (Route 8), but Stalingrad – Kamyshin is improved dirt or low-type gravel, and Vol'sk – Kazan' is only earth with seasonal trafficability. The other sections are all-weather. When completed, along with the south extension from Astrakhan', the route will be an important link with the Caucasus. The Volga has only three railroad bridges, and no highway bridges, along the 800 miles of its course from Kazan' to Stalingrad.

4. VULNERABILITY.—Except for the generalized vulnerability of important road junctions and industrial centers, particularly in the densely built-up areas and in the border regions where bridges and overpasses are concentrated, the network is such as to preclude selection of particularly vulnerable points or features. The structures, like the roads, are of different types and are rarely adequate for heavy traffic. Winter, in this country, improves the trafficability of most of the roads as well as cross-country routes, except in the Carpathian Mountains near the Rumanian border, where passes are sometimes blocked for weeks. War destruction was concentrated primarily on bridges but military traffic caused extensive deterioration, even to the best road (Route 1) in the USSR. Because of the inadequacy of the network and the roads composing the net, from the standpoint of heavy military traffic the entire system is vulnerable to bottlenecks which exist or are created.

5. RECONSTRUCTION AND EXTENSION.—The immediate postwar reconstruction of roads and an unknown number of damaged and destroyed bridges both in the area occupied by the Germans and the areas subjected to aerial attack possibly forestall any immediate and major extension of routes. Data on the number of bridges and miles of road which required repair or reconstruction are not available. Even in peace time the lack of efficient equipment and trained personnel contributed to a low standard of road maintenance of the inadequately constructed roads.

The main objectives of the road planning to improve the system are: connection of large industrial centers with each other and with ports; creation of through roads; preparation of the network for possible war with an enemy on the west. Each Five-Year Plan has provided for the building of first-class roads to meet those objectives, but the scarcity of essentials and the relatively secondary position of highways in planned development of the country have contributed to keep the roads in an undeveloped state.

(b) Highways and equipment

1. HIGHWAYS

a. Classification and numbering.—Roads in the Soviet Union are officially grouped first according to the importance and second according to type, quality, and capacity. The more important roads are assigned route numbers and are well marked, but specific data on the numbering systems in use are not available.

Roads are grouped in accord with relative importance as follows:

Group I. All-union importance and always the best long roads in a given region, but the technical characteristics may be the highest type of road, improved gravel, or dirt roads. It is planned that roads in this category be raised to all-weather routes for heavy traffic.

Group II. Republic importance and provide internal lines of communication within an administrative area and to contiguous areas. These roads are generally important to one Soviet republic or more, may be of any type, and take second place in the construction programs.

Groups III to VI. These roads are of decreasing importance, down to roads of only local importance. Many of these roads in industrial towns, ports, and larger cities have good base and surface. Otherwise the roads of these groups are generally poor gravel to unimproved earth types.

In this discussion route numbers have been arbitrarily assigned to only eight routes, of which seven radiate from Moscow, and starting with the Moscow – Minsk road, are numbered clockwise. The other route, Astrakhan' – Kazan' number 8, follows the west bank of the Volga river. Graphic presentation of the roads on FIGURE I-11 and PLANS 22 to 25 are grouped, without economic consideration, into four types: 1) all-weather, asphalt or concrete; 2) mostly all-weather, good base, possessing crushed rock, cobblestone, or asphalt surface; 3) seasonal, poor base, sub-grade, and improved dirt roads; 4) mostly seasonal, type of construction unknown.

b. Types of roads.—Adherence to fixed construction standards has been the exception rather than the rule. The lack of road metal, adverse climatic conditions, poor equipment and inadequate trained personnel, and large expanses of terrain with soil unsuited for road construction have hindered construction and adherence to specific types.

Only the Moscow – Minsk road in European USSR has been constructed to standards comparable to those of western Europe. Although some sections failed under the heavy military traffic during World War II, the road is substantially constructed with a good alinement, no sharp curves, and only slight grades. Some sections of the Moscow – Kazan' road are to be reconstructed to meet the same standards.

Other concrete or bituminous surface roads are lower quality. According to United States standards these roads are of light construction and the surfaces may be uneven, but generally the base is sufficient to support moderately heavy traffic in all seasons. In areas of unstable soil the base at some places is 16 feet or more thick. The base of large stones or slag is rolled and a finish course of sand or crushed stone added. Some sections of these roads have a bituminous binder and others are traffic bound. These paved roads are shown as the two higher classifications on the maps, according to available data on the type of road.

Seasonal roads are relatively usable according to season and area and consist of improved earth roads or low-type gravel roads. Drainage is a problem in the usability and maintenance of all of this class. They are motorable, as a rule, only during the summer dry weather and the winter deep freezes.

c. Widths of roads.—Acquisition of right of passage is no problem because all land belongs to the state, and even a minor road will have an extremely wide right-of-way. Width of roadway, traveled way, and shoulders vary between one road and another of the same class and/or type, and frequently from point to point along the same road. Widths of the roads become restricted only at entrances to towns and at bridges; the course of the road may be limited only by soil and weather effect, and possibly the presence of cultivated areas may result in slight change of course.

The best type of roads are 36 to 52 feet wide with 23 to 46 feet of pavement, but there are only two roads with these widths. The narrower traveled ways are frequently flanked by broad berms which are called "summer" roads and are used by animal traffic during the dry periods.

d. Grades and curves.—Maximum grades and minimum radii of curves are now established by administrative rulings for the several technical classes of roads and different terrain characteristics. German officers reported that any curve on the Moscow – Minsk highway could be travelled at 43 miles per hour. The hilly and mountainous sections, of course, have steep grades and sharp curves. Data on the specifications are unknown.

e. Base and surface materials.—The vast size of the country and the relatively small areas close to populated centers where stone is near the surface, combined with inadequate transport facilities to haul material from the more remote areas, combine to restrict the availability of good base and sub-grade materials. Consequently, most of the roads are either not reinforced or industrial waste material and usually abundant logs are used where available. The large amount of stone ballast planned to be placed on the railroad roadbeds will consume much of the fragmented stone supply, at least during the current Five-Year Plan.

Cement plants are few and situated at large industrial centers. Natural asphalt is obtained from three places, two of which are in the east-central European USSR and the other just beyond the area limits. The 1941 planned production of asphalt was about 165,300 short tons, only about 12,000 more than was mined in 1938. The synthetic products would contribute materially to the total available, but bitumen products, as well as cement, are in relatively short supply for the tremendous amount of needed reconstruction.

2. STRUCTURES, FERRIES, AND FORDS

a. Bridges and culverts.—Complete data on highway bridges of European USSR are not available, but the known bridges which exceed 265 feet in length are located on PLANS 22 to 25, and those pertaining to the selected strategic routes appear on FIGURE I-11, divided into structures between about 164–492 feet (50–150 meters) and more than 492 feet long. A summary of the known highway bridges, including 9 dual railroad-highway structures, by lengths is:

NUMBER OF BRIDGES	LENGTH *Feet*
133	164- 490
31	491- 980
14	981-1,639
11	1,640-2,624
4	2,625-3,280
4	3,281-4,920
1	5,905
1	6,561

The more important bridges and particularly those in the larger cities are good modern designs of ferroconcrete, but as late as 1938–39 a large portion of the bridges in the open country were of timber construction. Timber construction is used more frequently for the shorter bridges in the more remote areas, but there are some long wooden structures. One 6,560-foot long structure of timber (No. 1126) spans the Dnepr at 49°25′N, 32°03′E, and a 3,116-foot floating timber bridge provides the means by which the Bug is crossed to reach Nikolayev from the west. The types of structures are known for only part of the bridges summarized above, and they are: 55 timber, 26 concrete, 8 masonry, and 28 steel. Just preceding the outbreak of World War II the Baltic States had built many concrete and steel bridges.

Load capacities, widths, clearances, bypasses and related data are inadequate for a conclusive report. Three concrete bridges (Nos. 1011 to 1013) on route 1, are reported about 40 feet wide and as having a "military capacity" of about 71.7 short tons (65 metric tons). But on the same route where it crosses the Pripet Marshes, bridges of unknown widths, two of concrete and two of wood are reported as having a military capacity of only about 17.6 short tons. The capacities range downward to

as low as 2.2 tons. Many of the timber bridges have a load capacity greater than some of the steel, concrete, or masonry bridges.

Long road stretches, as well as railroads, are shown traversing natural drainage without indication as to how stream crossings are made. Undoubtedly bridges and culverts are located at many of those points, but the bridge information is sketchy and there is no information on culverts.

b. Ferries, fords, and cableways.—Crossings of many of the larger rivers are via ferries, fords, and in some instances cableways, and many of the smaller streams are crossed only by fords.

The locations of 14 known ferries are shown on PLANS 24 or 25, except the one at Kirov, shown on PLAN 23. Capacities, time required for crossing, and other data are unknown. There are other ferries in port areas, such as Arkhangel'sk and Leningrad, as well as at other inland river points.

Fords are known to be extensively utilized in European USSR, and even larger rivers are fordable at many places and in the dry season become fordable for almost their entire lengths.

Cableways are occasionally used for crossing rivers in lieu of bridges. Across the Volga at Stalingrad is an 8.8-short ton capacity transporting structure, 5,900 feet long and supported by 310-foot towers. It will accommodate a 3-ton truck and the crossing time is 6 minutes.

Generally the rivers are frozen in winter for various lengths of time, and not only does the ice provide a bridge but frequently the frozen rivers are more motorable than the roads.

c. Tunnels.—Little material is available on the highway tunnels of European USSR. The predominantly flat or rolling terrain would preclude the necessity for many tunnels. In the mountainous regions, where roads are unprotected by overhanging rock, some timber or concrete "tunnels" are designed to provide chutes to carry snow slides across the road and into the valley below.

Information on the locations of underpasses or tunnels is restricted to the underpass between the two chambers of lock 8 beneath the Kanal Imeni Moskvy, just west of Moscow on the road to Volokolamsk.

3. FACILITIES.—Little information is available on the facilities available along the highways of European USSR. Garages, filling stations, and repair shops are relatively few except in the larger centers and military and other governmental installations.

4. EQUIPMENT

a. Vehicles.—In 1913 Russia had 8,800 vehicles of all kinds, 15,000 at the end of the civil war, and only 18,000 in 1928, all of which were imported. Government monopoly manufacture of automobiles commenced in 1929. Between 1930 and 1940 registration of motor vehicles was increased from 57,640 to 801,000 vehicles. Ownership of vehicles is practically a government monopoly. The registration possibly is less than the vehicle inventory. The Fourth Five-Year Plan has set a manufacturing goal of 500,000 annually to be attained by 1950, and 80% of production is to be trucks. The planned inventory for 1950 approaches 2 million vehicles of which more than 90% is to be trucks. The total vehicle registration for the United States in 1946 was more than 34 million vehicles, of which 5.7 million were trucks and truck tractors.

The Soviet-manufactured vehicles consist of a few basic types and chiefly trucks. Two truck models use diesel fuel; the largest of these is the YAZ-200 with 4 cylinders, 98.6 U. S. hp., and a rated capacity of 5.5 to 7.7 short tons and a speed of 37 miles an hour. The gas-fueled trucks are 6-cylinder models with capacities ranging from 2.2 to 3.9 short tons. Two 4-cylinder and 8-cylinder passenger cars are gas fueled. The U.S. horsepower ratings are 22.7, 49.3, and 138. The latter is a 7-passenger luxury sedan rated at 87 miles per hour. The others are 4- and 5-passenger vehicles with speeds of 56 and 68 miles per hour.

b. Construction and maintenance equipment.—Mechanical equipment is manufactured but details as to types and inventory are not available.

(c) Strategic routes.—Seven of the eight through routes converge at Moscow and the other is a north–south route, Kazan'–Astrakhan', which connects at Kazan' with route 4 to Moscow. These routes consist of paved and unpaved roads which form the better highways of European USSR, but are not necessarily all of the partially paved routes. Other short sections of good roads are in other directions and are important to the local areas.

1. MOSCOW–MINSK–BREST.—This 674-mile route connects the capital with White Russian SSR and is the main highway route into western Europe. Originally planned to have a 4-inch reinforced concrete base and 1.2-inch bituminous surface on the entire route, it is not completed. It has a good base for the entire length, but concrete only for 430 miles to Minsk. From there for 62 miles to Slutsk through swampy terrain it is mostly all-weather with a traffic bound crushed rock surface. The 182-mile remainder of the route is bituminous-surface, all-weather road. The original paving was destroyed in several places and the concrete base failed under the heavy traffic during the German invasion.

There are 19 known bridges totaling 4,935 feet on the route and the longest (1188) is 1,083 feet across the Berezina and constructed of timber. At the same place, 54°17′N, 28°30′E, a 328-foot steel bridge (1131) is located. In addition to these two there are 6 other bridges totaling 945 feet and 6 culverts totaling 315 feet between Yartsevo and Borisov. Nine of the known bridges totaling 1,929 feet are located along the 152-mile stretch through the Pripet Marshes between Slutsk and Kobrin.

The traveled portion of the road is generally about 40 feet wide.

2. MOSCOW–LENINGRAD.—The 451-mile road is all-weather and between Moscow and Vyshniy Volochëk via Torzhok for 182 miles it is bituminous surface. The remainder of the 26-foot-wide traveled way is intermittently bituminous surfaced and contains road holes. Between Valday and Novgorod there are 7 known bridges totaling 1,243 feet, and the longest (1070) near Novgorod is 699 feet long and of concrete. There are at least 2 culverts in the same stretch. Six short culverts and two bridges totaling 220 feet are on the stretch between Chudovo and Leningrad. The city of Leningrad has more than 400 bridges; the number that this route crosses in the city is unknown.

3. MOSCOW – SHCHERBAKOV – ARKHANGEL'SK.—Between Moscow and Shcherbakov, 201 miles, the traveled way is between 26 and 39 feet wide with all-weather bituminous surface. The 44-mile section, Yaroslavl'–Shcherbakov, has a good base and a 33-foot traveled way. Between Moscow and Zagorsk both sides of the road may be used. The estimated 500-mile Shcherbakov–Arkhangel'sk stretch is improved or partly improved dirt road. The 233-mile section to Vel'sk (61°05′N, 42°08′E) is impassable to motor vehicles after a heavy rain. North from the latter place the road, after about 100 miles, follows the Vaga river which it crosses at least twice north of Vel'sk

and thence along the left bank of the Severnaya Dvina into the Arkhangel'sk area. North of Vel'sk the road is impassable to motor vehicles. The identified bridge (1139) spanning the Volga at Shcherbakov is a 2,297-foot steel structure.

4. Moscow – Gor'kiy – Kazan'.—This 502-mile route is an all-weather, bituminous-surfaced highway for about 260 miles to Gor'kiy, but from thence on it is a seasonal road unusable by heavy vehicles after a heavy rain. The roadbed to Gor'kiy varies from 26 to 39 feet wide, the base has about 30 inches of stone, and the surfaced traveled way varies from 16 to 26 feet wide. The Klyaz'ma river is crossed at Noginsk (55°52'N, 38°20'E) and at Gorokhovets (56°12'N, 42°40'E) by ferry and east of the latter by a 1,969-foot ponton or timber bridge (1032). At Gor'kiy the Oka river is crossed via 3,281-foot concrete structure (1136).

The 242-mile remainder of the route generally follows the right bank of the Volga passing through hilly and mountainous terrain. The 100-mile section, Gor'kiy – Vasil'sursk, is an improved seasonal road and the Cheboksary – Kazan', 89-mile section has a good base; both sections are impassable for heavy vehicles after rain. The intermediate section has an inferior base and cannot be used by vehicles after rain.

At Kazan' route 4 junctions with route 8 which passes through Stalingrad to Astrakhan' and thence south into the Caucasus. Four other roads converge at Kazan'.

5. Moscow – Tambov – Kamyshin.—This route consists of about 564 miles of various types of road, but most of the mileage consists of seasonal roads. The road passes through several inland river ports on the Oka and junctions with route 8 at Kamyshin on the Volga, about 382 miles upstream from Astrakhan'. Moscow via Kolomna – Ryazan', 168 miles, is all-weather with a good base and bituminous-surfaced 20-foot traveled way. Ryazan' – Tambov, estimated 186 miles, is all-weather to about Michurinsk with a good base and a traffic-bound crushed rock surface, but the southern part is seasonal with a poorer base. Tambov – Balashov, 112-mile section, is seasonal with a base of inferior quality. The remainder of the route is profiled and crowned, with ditches; the northern part is mostly all-weather with good base and probably a traffic-bound crushed-rock surface, but the southern mileage is mostly seasonal road.

There are several timber bridges along the route, but other data are unknown.

6. Moscow – Khar'kov – Sevastopol' (and Rostov).—This road is about 888 miles long to Sevastopol' and the branch (route 6A) from Khar'kov to Rostov is about 307 miles long. The road to Sevastopol' has a generally good base and is mostly all-weather except for two intermediate sections. The first poorer section is Khar'kov – Zaporozh'ye, 178 miles through hilly terrain, and consists of a seasonal improved-dirt road which is impassable for traffic during about 10 days each spring and unusable by heavy traffic after a rain. One of the longest bridges (R.R. 356), a 4.114-foot, highway-railway dual bridge, spans the Dnepr at Dnepropetrovsk on this section of the road. At Zaporozh'ye two other long and important dual bridge sites (R.R. 80a and b on Plan 24) (1128 A and B on Plan 24 and Figure I-11) are located. Both were destroyed in February 1944 but were originally double-deck steel with a single-lane highway on lower deck with a double-track railway on the upper deck. The longer (1128A) spans the river on the east side of Khortitsa island and is variously reported from 2,264 to 2,313 feet long. The other (1128B) is 1,214 feet long and on the west side of the island. These two bridges are extremely important because traffic over them, especially rail, connects the important steel center of Krivoy Rog with this highway and rail route 4.

The other poorer road section, the first 120 miles south from Melitopol', includes the crossing of the Sivash via Poluostrov Chongar to the Crimea Peninsula.

In addition to the three bridges discussed above there are 16 others, one of which (R.R. 162) is a dual double-deck 1,485-foot steel structure across the Oka. At Kursk, spanning the Tuskor', are a 590-foot timber bridge (1115) and a 984-foot concrete bridge (1117). At Mtsensk (53°17'N, 36°28'E) a ferry and a 394-foot bridge (1116) cross the Zusha. The 12 remainder average about 110 feet long except the timber bridge (1120) across the Psël, which is 328 feet long. The identified and located bridges between Moscow and Sevastopol' total about 12,668 linear feet of structures.

From Moscow to Rostov-na-Donu via route 6 is about 449 miles long. This branch from Khar'kov to Artemovsk, about 160 miles, is all-weather with a good base and probably a bituminous surface; through Stalino to Chistyakovo, about 60 miles, the road is mostly all-weather with traffic-bound crushed rock surface. The remainder, about 87 miles, into Rostov is an improved dirt road. On this branch route is one identified culvert and one 138-foot bridge. The traveled way from Stalino is about 23 feet wide.

7. Moscow – Kiev – Odessa.—This road for its entire length of about 928 miles has a good base and is mostly all-weather although considerable distances are through lowlands. Although numerous river crossings are made, including the Bug at Pervomaysk and Tiligul at Berezovka, the identified bridges are restricted to those at Kiev, or nearby. One (R.R. 74) is a 3,481-foot railroad-highway bridge which was scheduled for completion in 1941. The other three are steel highway bridges of the following lengths: (1123) 820 feet; (1124) 2,625 feet; and the longest of all four, (1125), 5,906 feet.

8. Kazan' – Stalingrad – Astrakhan'.—This route, west of the Volga for its entire mileage follows the right bank for a considerable portion of the approximately 880-mile distance. (The distances are approximate for the entire route.) The first 124 miles to Ul'yanovsk has a good base in part; the next 186 miles is an improved-dirt, seasonal road to Vol'sk; the next 186 miles through Saratov to Kamyshin is an all-weather road, built especially for heavy traffic and consists of stone paving. From Kamyshin to Stalingrad, about 115 miles, the route reverts to a seasonal, improved-dirt road. The 267-mile remainder, Stalingrad – Astrakhan', although the stone pavement is mostly in poor condition, has a good base. From Astrakhan' a road leads to the west and south to the Caucasus inland from the Caspian.

(d) Operations and traffic

1. Supply.—There are no data on the distribution of fuel stations along the routes, but because ownership of motor vehicles is vested almost entirely in the Government, the location and spacing of stations would be only adequate to meet essential requirements.

2. Affect of weather.—Spring, other than on all-weather roads, is the time of impassability over most of the roads. The run-off of melting snow causes tremendous floods and the impact of broken-up ice in the rivers frequently damages if not destroys many bridges. The following period of thawing by day and freezing by night creates a false hard crust through which wheels and tracks

of vehicles sink and animals may break their legs. Following this is the extended thawing without freezing and the roads become seemingly bottomless; this period of non-trafficability lasts from two to four weeks according to the area. After complete thawing the roads dry out rapidly, but roads in the forest area may remain suitable only for sleighs for several weeks after wagons have commenced using the roads in the open ground.

Although summer is the best period of road utility, weather instability must be taken into account. Rains immediately reduce the trafficability of dirt roads everywhere. The weather in the Baltic States and Leningrad area is particularly variable. In the black-earth area, broadly the South Ukraine - Donbass - Middle Volga regions, the roads become very slippery after a rain, but because of the absorbent soil they dry quickly.

Downpours of rain in autumn cause damage to roads everywhere in the country, especially in the marshy areas. Dirt roads with only shallow drainage ditches become impassable until the early winter freeze. Alternating frost and thaw during early autumn causes a crusted condition as in spring. Frequently deep frost solidifies the rutted roads, and the resulting hard and uneven surface places a strain on wheeled vehicles, although sleighs and tracked vehicles negotiate the surface without too much hindrance.

Generally speaking, the frost period is second to summer for trafficability of roads, because firmness is given to roads, even those which are without reinforced base, and solid ground off the road makes by-passing fairly easy. But, as the frost period progresses into winter, there occurs the normal interference of deep snows when roads become blocked with drifts, especially in the northern areas. The abundance of snow, however, in the northern, eastern, and central regions makes cross-country routes easily traversable. The frozen swamps and rivers will bear traffic and heavily laden sleighs move safely throughout the area. Snow drift has been practically eliminated from the Moscow – Minsk highway by elevation of the road, in some places ten feet above the surrounding ground, to allow the wind to sweep the snow from the highway.

European USSR is roughly divided into four zones according to the frost and winter period:

Duration	Area
6-7 months	Arkhangel'sk and northwards.
5 months	A strip passing through Leningrad, north of Moscow, and south of Kuybyshev.
4 months	A strip through Rīga, Minsk, north of Kiev, through Poltava and Kamensk-Shakhtinskiy, and south of Stalingrad.
3 months	A strip through Odessa, Kherson, Azov, and south of Astrakhan'.

3. Traffic.—Automotive transport in the USSR was only beginning at the start of World War II. The Soviet secret plan for 1941 allotted 54.5% or 995,106,000 short tons of domestic shipments for truck haul, but the average short haul of 6.5 miles relegates truck transportation traffic to a relatively insignificant position. Truck ton-mile traffic represented only 2% of all transportation. The relatively insignificant position of truck transportation in the economic pattern was demonstrated during World War II when most of the trucks were used by the Red army, with little or no effect upon the required domestic shipments.

Busses operate on regular routes, particularly in and out of the larger cities and in the Baltic States, but specific data on routes or schedules are not available.

Highway and street traffic move on the right; other traffic regulations are not available. The roads and their conditions impose speed limits regardless of the established limits, which are unknown. New and improved roads are being built to allow for greater speeds.

(3) Inland waterways

(a) General.—A dense network of natural waterways, generally radiating from Moscow, provides transportation arteries for the plain of European USSR (Figure I-11 and Plans 22-25). Because of the low elevation of most of the watershed, the rivers are wide and flow with relatively slow velocities, and artificial linking through canals is comparatively easy. Despite the natural advantages, effective utilization of the waterways is low compared either to that of other countries or to railroads in the Soviet Union.

(b) Development and planned construction.—The waterways were the backbone of Russian transportation for centuries, and as early as the time of Peter the Great (1689-1725) the interlinking of natural waterways by canals was undertaken. A few canals of dwindling importance when compared with modern works were completed under tsarist regimes. Large-scale inland waterway development was inaugurated with the Five-Year Plans, transportation being an interrelated phase with hydroelectric power, irrigation, and water supply. Only waterways as related to transportation are considered in this topic.

The announced objective of waterway development is to make Moscow the head of navigation or an inland "seaport," with direct connection for large vessels plying the surrounding seas. A tangible part of this scheme, to provide inland water traffic arteries from the Baltic Sea to the Urals and from the Black Sea to the Arctic Ocean, is the Baltic-White Sea Canal which was completed in 1933. This route reduces the water distance from Leningrad to Arkhangel'sk from 2,200 miles via the open sea to about 500 miles via the inland route. Although used extensively for war ships during the war, utilization is limited to vessels with drafts of destroyers of the *Engels* class.

Other works completed before the war included: the Moscow-Volga Canal in 1937; improvement of the Pripet-Bug Canal; the Dnepr Dam in 1933; and a part of the Manych Canal. The Moscow-Volga is considered one of the world's major artificial waterways and a part of the program to connect Moscow with the Caspian Sea for large vessels on the sea and the Volga. The Manych Canal is designed to provide a waterway between the Sea of Azov and the Caspian Sea.

The growth of the railroads in the country during the last quarter-century has relegated the waterways to a secondary position in terms of utilization. The Soviet Government has taken cognizance of the decrease of effective utilization, which is reflected in the lesser tonnage and shorter haul on the waterways and the greater tonnage and longer haul on the railroads, and plans have been announced to reverse this trend.

A Soviet source reported that about 52,500 miles of waterways were being exploited for navigation in the entire USSR in 1937. Another prewar report gave 22,400 miles as the amount of navigable waterways in European USSR. The mileage of the Baltic States is probably additional. Many of these "navigable" rivers are suitable only for very shallow boats, barges, and timber rafts. Others are considerably affected by the seasons, navigation being impeded during the dry summer and halted in winter.

Winter freezing, however, provides extensive arteries for sleigh and other vehicular traffic on the frozen rivers.

In addition to the natural obstacles which somewhat offset the natural advantages, other drawbacks include the lack of technical personnel, ineffectual administrative control of personnel, poor maintenance of the waterways and fleet, and inefficient administration. These elements partially explain the loss of effectiveness of the water transport system. Freight carried by the waterways in 1913 amounted to one-third of that carried by rail, but by 1937 the proportion had fallen to only one-eighth. This 1937 figure is about one-half of the inland waterway traffic borne in the United States.

A considerable amount of the loss of effectiveness is due to depletion of the river fleet during the First World War and the ensuing Civil War. Despite subsequent efforts to rebuild the river fleet, the number of vessels, horsepower of self-propelled units, and the tonnage of dumb * craft in 1941 were still short of the 1913 totals. Efforts to modernize the fleet included change of composition by putting into service units of greater motive power and tonnage. This trend was continued up to the outbreak of hostilities. A comparison of reported river fleet totals preceding the two world wars is:

Year	Self-propelled		Dumb	
	Units	*Horsepower*	*Units*	*Tonnage* (Short tons)
1913	5,302	1,309,000	23,149	15,077,000
1941	3,600	810,000	11,500	9,700,000

The impact of World War II, despite war booty, reparations, and recovery of captured and sunken vessels, further depleted the river fleet and it is estimated that the indicated postwar horsepower of the self-propelled units totaled about 530,000. Similarly the dumb fleet should have been about 6,338,000-short ton capacity.

Mechanization of handling facilities has progressed in some respects, but as yet is far below efficiency.

(c) Administration.—The Ministry of River Transport, through five central administrations and between 35 and 40 regional administrations, manages the inland waterways. Through regionally established shipping lines or other agencies attempt is made to operate all effective craft, maintain channels and navigation aids, and operate some port facilities. There has been little success in the operation of ports, and other agencies have performed about 70% of this work.

The regional administration shipping lines operate on specific routes with most of the craft, but some small craft are operated by local commerce, collective farms, and similar organizations for their own purposes. Other Government agencies, each of which appears to serve the system as a whole, have functions relating to supply of labor and material, wooden shipbuilding, and other aspects of the entire system.

Although administrative control is supposedly centralized, personnel are not amenable to such supervision. This ineffectual control is indicated in the amount of shipping which is consistently below quota. Frequent criticisms from the Soviet press deal with the poor organization at high levels and down to inferior workmanship in construction and maintenance.

(d) Pattern of the waterways network.—The concentration of the principal transportation arteries is quite pronounced in European USSR. In that area, which is a little less than one-quarter of the entire USSR, is located more than one-half of the aggregate length of principal rivers. The longest rivers of Europe, excepting the 1,725-mile Danube which ranks second to the 2,290-mile Volga, are in European USSR. These long rivers, with their tributaries, form a network of navigable waterways about one-third as dense as the railroad network. The rivers above about 60°N are north flowing, a few on the west flow into the Baltic waters, but the majority of the rivers flow south into the Black Sea – Sea of Azov waters and, of course, the Volga into the Caspian Sea. The proposed canals, added to the existing links, will enhance this extensive network which flows in every part of European USSR except the Karelia and Kola peninsulas.

The main rivers which form the basic waterways structure radiate from Moscow, as from a hub, to the five seas:

To the southeast:	Volga to the Caspian Sea
To the south:	Don to the Sea of Azov
To the southwest:	Dnepr to the Black Sea
To the northwest:	Daugava (Zapadnaya Dvina) and the Volkhov via the Neva to the Gulf of Finland in the Baltic Sea
To the northeast:	Sukhona via Severnaya Dvina to the White Sea

The Volga, Dnepr, and Daugava sources are at the Valdai plateau; the Don rises near Tula, about 125 south of Moscow; the Sukhona starting at Ozero Kubenskoye, about 300 miles north-by-west of Moscow flows northeast and helps form the Severnaya Dvina which flows northwest to empty into the White Sea at Arkhangel'sk.

Other important channels originating farther from the Moscow region are:

North:	Pechora and Mezen' to the Barents Sea; Onega to the White Sea; and the Stalin White Sea Baltic Canal through lakes and river channels to the White Sea.
West:	Narva, Venta, Neman, Pregel' to the Baltic Sea.
South:	Three rivers flowing southwest and approximately parallel into the Black Sea are the Yuzhny Bug, Dnestr, and the Prut; the last and most southern flows with the Danube to the sea.

Those principal rivers with numerous tributary streams form the several river systems which are, or are to be, linked with each other.

1. Volga system.—The 2,290-mile Volga is the longest river in Europe and is the main trunk of a system which consisted of about 6,000 miles of usable waterways in 1935. The Volga is regularly navigable for about 2,000 miles from its mouth, 71 miles below Astrakhan'.

The main left bank tributary is the 1,180-mile Kama which is navigable for about 930 miles. The main right bank tributary is the 915-mile Oka which is navigable for about 728. The Moscow tributary of the Oka via the Kanal Imeni Moskvy (Moscow-Volga Canal) provides a western connection for the Oka in addition to its normal confluence with the Volga at Gor'kiy.

Other tributaries of the Volga are: left bank—Mologa, Sheksma, Vetluga Samara; right bank—Sura. The Mologa and Sheksma flow into the Rybinskoye Vodokhranilishche (Rybinsk Reservoir) which is a water-level controlling body for the Volga system. The reservoir is also the first link of the Mariinsk waterway system which also uses the course of the Sheksma. Secondary but important tributaries of the Volga are the Vyatka and Belaya (mostly outside Janis 40 area) tributaries of the Kama (partly outside the area).

The Volga system via tributaries and canals is or is planned to be linked with all seas surrounding European

* Water craft having no motors, masts or sails, and depending on outside power, as of a tow, flow of river or tide, for locomotion; as, a *dumb* barge; a *dumb* lighter.

USSR, and the Ural river. Connection with the Baltic and White Seas is via the Mariinsk Waterway and the White Sea – Baltic Waterway systems. The eastern part of the Mariinsk Waterway and the Severo Dvinskiy Kanal connect the Volga with the Sukhona, western tributary of the Severnaya Dvina which flows to the White Sea, emptying at Arkhangel'sk. The Yekaterininskiy Kanal, now in complete disrepair, connects the Volga tributary Kama with the Vychegda, the principal and eastern tributary of the Severnaya Dvina. A proposed canal, possibly under construction, is the Kama-Pechora canal between a point just below Tulpan (61°21'N, 57°25'E) on the Kolva, a secondary tributary to the Kama almost due north to the Pechora. When completed this will provide a Barents Sea – Caspian Sea route, and establish a reservoir of water for the falling Caspian Sea. An unconfirmed canal utilizing the Samara river supposedly connects between Kuybyshev on the Volga and Chkalov on the Ural (outside JANIS 40 area). The Volga-Don canal is to be constructed between the two rivers at their nearest points below Stalingrad. The proposed Dnepr – Volga canal will connect the Desna tributary of the Dnepr with the Zhizdra, a tributary of the Oka.

2. DNEPR SYSTEM.—The second longest river in European USSR and the third in Europe, is the 1,410-mile Dnepr. About 1,200 miles of its length is navigable and the trunk of a system of which about 2,650 miles were utilized in 1935. This system courses through the southwestern part of European USSR with tributaries entering on each side. The more important tributaries are the 670-mile Desna which is navigable for about 435 miles from its mouth to Bryansk, and the 497-mile Pripyat' which is navigable for 373 miles.

The Dnepr – Volga canal route will utilize the Desna, the Pripyat' is utilized by the Dneprovsko-Bugskiy Kanal to link the Wista, and the Oginskiy Kanal to link the Neman.

Although not a tributary, the Yuzhny Bug which is navigable for more than a hundred miles, is considered administratively a part of the Dnepr system.

3. DON SYSTEM.—The 1,235-mile Don ranks third among the European USSR rivers and is navigable for about 1,000 miles. The Donets is the chief tributary. The Volga-Don Canal will connect the Don with the Volga at Stalingrad. The partially constructed Manychskiy Kanal will course from a point upriver from Rostov-na-Donu to an outlet on the Caspian Sea just south of the JANIS 40 boundary line.

4. DNESTR AND PRUT.—These two rivers are in the southwestern part of European USSR and flow from the Carpathians to the Black Sea. The Prut forms a part of the Rumanian-USSR border and empties into the Danube.

5. WESTERN AND NORTHWESTERN WATERWAYS.—The rivers and canals in this part of European USSR flow toward the Baltic or into waters that lead to the Baltic.

The most important waterway is the White Sea-Baltic Canal which connects the White Sea with the Baltic. The rivers and canals which formed the Mariinsk waterway system are to be rehabilitated.

In addition to the canals discussed under the Dnepr system, canals are to be constructed to connect the Daugava and the Volkhov rivers with the Dnepr.

6. NORTHERN RIVERS.—The Severnaya Dvina is formed at the confluence of the Malaya (Little) Dvina and the Vychegda rivers and flows past Arkhangel'sk into the White Sea. It is navigable for its entire length of about 418 miles. The western tributary, Sukhona, provides a route connecting with the Volga system. The Vychegda river is the eastern tributary and is navigable for about 420 miles.

The Pechora, during its short navigation season, is usable for about 932 miles. It flows into the Barents Sea and, when the proposed Pechora-Kama canal is completed, traffic will be able to move via this route between the Barents and Caspian Seas.

The other rivers are of local importance and have relatively short navigation seasons.

The Stalin White Sea-Baltic Canal opening into the White Sea at Belomorsk connects the two seas and indirectly connects with all other waterways of the principal systems.

7. LAKES.—The lakes of European USSR are concentrated in the northwest. The important bodies are east and south of Leningrad and are connected by navigable rivers or canals. The water levels are moderately constant and serve to maintain navigation levels in the connected waterways.

(e) Waterway characteristics.—The flat terrain of European USSR makes sandbars, reefs, islands, and shallows the more serious obstacles in most major rivers, including the Volga, Don, Dnepr, and Pechora. The mouths of large rivers are particularly susceptible to silting and many have deltas or broad shallow estuaries. On the other hand, rapids are comparatively rare although some are in the Dnestr, Daugava (Zapadnaya Dvina), Onega, and the streams of Karelia and Kola. Dam-created reservoirs on the Dnepr and Svir' cover former rapids and the waterways development program includes additional reservoirs partially for this purpose.

Flat profiles but tortuous courses are predominant in most rivers except those of Karelia, Kola, and the northwest. The gradients of the navigable portions of the main rivers vary from 0.6 to 6.3 inches per mile. Gradients of each river have various ranges with the steeper gradients usually in the upper courses. The only exception in an important river exists in the Sukhona which has gradients ranging from 0.3 to 2.9 in the upper reaches and from 10 to 13 inches per mile in the lower reaches. Gradients of main trunk rivers are:

RIVER	OR RANGE LOCATION OF MEASUREMENT	INCHES PER MILE
Volga	Astrakhan'	0.95
	Gor'kiy	3.8
	Rzhev	19.
Don	Average	3.8
	Minimum	0.89
	Maximum	8.9
Dnepr	Zaporozh'ye	3.2 - 5.7
(now controlled)	Dnepro-GES (dam)	21.
Daugava	Minimum	9.5
	Maximum	48.
Severnaya Dvina	Minimum	0.6
	Maximum	5.7

The steepest gradient is reported on the 27-mile Niva which issues from lakes and enters the bay (guba) at Kandalaksha. The average gradient is about 18½ feet per mile and several hydroelectric plants are located on the course. The rivers of Karelia and Kola alternate between lakes and rapids. The range of the Pechora is from 1 to 11 inches, but the Onega has the steepest gradients and greater range of the important northern rivers. The average of the Onega is 16.9 inches with a maximum of 18 feet in the rapids.

The low gradients common to most rivers are accompanied by low velocities, generally between 1 to 3.3 feet per second. Spring floods, however, may double or even

triple the normal rates of flow; in summer the smaller rivers, especially in the Ukraine, may dry completely.

Wide rivers are common. The Volga varies from 300 to 400 feet in its upper courses and from about 2,000 to 7,100 feet in its lower courses. At its spring peak it may reach widths in excess of nine miles at numerous places. Most other rivers are comparable, considering their proportionate size and the type of banks along their courses. In the northwest, however, the rivers are fairly constant and do not form large flood plains.

The lower courses of the major rivers, the streams of Karelia and Kola peninsula, and the lake-fed rivers of the northwest have depths of 66 feet and more, but their average depths throughout are only about 3 to 10 feet. Spring floods may cause a rise of as much as 52 feet above mean water level in the Volga – Kama area. The minimum levels of the major rivers may vary as much as 10 feet from year to year, but in the northwest this variation is lessened by the lakes which are natural reservoirs. The low water levels accentuate obstacles and impede navigation, and many of the rivers need constant dredging. The mouths and estuaries of the northern rivers are subject to tidal variations. All are subject to change by winds.

With some exceptions the right banks of the rivers of European USSR are higher than the left banks. This is particularly true in north - south flowing streams, and generally the more important river towns are on the higher bank. The Volga, Don, and Dnepr have predominantly high-right and low-left banks. Rivers in the southwest and those emptying into the Baltic generally have high banks, whereas the banks of the major rivers are mostly low and often swampy in some sections. The banks of rivers in the lake area and far north are low and flat.

The waters of the Volga and Don are hard, with considerable permanent hardness. Turbidity of major southern and far northern rivers is quite high. Information on chemistry of the rivers, worm, rot, and other similar conditions is sketchy. There is considerable growth of water plants in some Dnepr tributaries.

(f) Seasonal variations.—The peak water levels, greatly exceeding the mean levels, are usually reached four to eight weeks after the spring thaws. During summer the levels usually fall and remain low throughout the winter freeze which affects all rivers, with the lowest levels reached just before the spring thaw. The date of freezing varies from year to year and so does the date of thaw ing. The passage of ice may last only a few days in the upper reaches but continue for as much as a month in the lower part of major rivers. As the ice moves downstream it frequently jams to cause floods, and at all times endangers structures.

(g) Maintenance.—Prior to World War II the major rivers and some smaller important rivers were dredged regularly and other less important rivers less regularly. The 1934 dredge fleet numbered 153 craft, mostly the bucket type, and only 4 were scheduled for construction that year. By 1941 scheduled completion for that year had been increased to 8 of the 12-bucket and 2 of the suction type. Normal attrition combined with war losses probably resulted in a postwar fleet smaller than the prewar fleet. Practically all of the dredges on the Don and Dnepr were destroyed.

In 1934 more than 200 snag removal craft were in operation, 29 on the Volga alone, performing this essential maintenance task. This essential equipment is probably in short supply because of the war.

(h) Navigational aids.—A system of lights and markers, fairly well standardized, is used on most of the waterways. Certain small areas such as the Volga Delta, however, deviate from the standards. Almost every stream of any importance has some markers, and reportedly 75% are lighted for night navigation. Pilots are required in some places.

(i) Crossings.—Bridges are negligible obstacles to navigation and there are no fords on the major rivers. Many of the smaller streams dry in summer and become easily fordable. Some of the major rivers become fordable at some places during the dry seasons, and the ice formed during the long winters has considerable weight-bearing capacity. At Arkhangel'sk, for example, railroad tracks are laid on the ice from the city on the right bank to the station and main line on the left bank of the Severnaya Dvina.

Ferries are important in urban traffic and have carried steadily increasing numbers of passengers.

(j) Traffic.—The most prewar ton-mile traffic moved on the Neva-Svir' system, Volga and Kama, and Severnaya Dvina, and this pattern probably has changed but little. On the Volga the cargo is primarily oil being moved upstream, on the others mostly timber in rafts and barges being moved downstream. Other bulky commodities are moved, of course, and in a typical prewar year the ton-mile traffic by classes of commodities were:

Cargo	Percent of traffic
Timber in rafts	30
Timber in barges	15
Oil	30
Mineral construction material	10
Grain	5
All other	10

The long-distance movement of oil, an average of 724 miles in 1937, gives that commodity a high percent of ton-mile traffic, but the volume is relatively lower. On the other hand, timber volume is high and distance less. Figures on timber tonnage moved exclude a high volume of loose and unrafted logs floated downstream.

The latest year of complete figures on tonnage and distance is 1937 for the four major cargo commodities:

Commodity	Millions of Short tons	Miles
Timber:		
In rafts	30.08	286
Carried cargo	9.03	286
Oil	8.7	724
Mineral construction materials	10.47	131
Grain	4.74	250

In 1932 about 27.5 million short tons of timber were floated loose, but the danger to other traffic and the amount of timber lost has resulted in a more rigid control of movement by that method.

Only a negligible part of the inland waterway traffic moves directly in the export-import traffic; most is transshipped at ports and intermediate points of shipment.

Although urban ferry passenger traffic has steadily increased, long distance passenger traffic has changed but little.

(k) Principal river ports.—Little information is available on specific ports. The principal commercial ports are shown on Figure I-11, but almost without exception each community on a navigable waterway has some waterway cargo traffic. Landing stages are the most common port facility, but the natural banks are used in many places.

Inefficient handling of cargo has been an uncorrected problem and an impediment to expansion of river traffic.

Slow improvement has been made, and since the war a high percentage of cargo has been handled mechanically, but only because the volume of cargo has been low, not because of great improvement or increase of facilities.

The most important ports are on the Volga-Kama-Oka route, and Astrakhan' is by far the most important. About 72 miles downstream from Astrakhan' to the river mouth and about 31 miles offshore is the "16-foot roadstead" which is the transfer point for oil cargo. The next two important ports on the Volga are Stalingrad and Gor'kiy, but heavy traffic also moves eastward to Molotov (outside the JANIS 40 area) up the Kama, and westward to Moscow. There are three separate port areas at Moscow, the center of the entire waterway network. Other cities, including Leningrad, Arkhangel'sk, Kherson, and Rīga serve as river ports but are primarily seaports. An announced Soviet intention is to make Leningrad "the largest river port in the world".

About 75% of port facilities in the occupied areas were destroyed or extensively damaged during the war.

(l) Shipbuilding.—During 1930-35 the shipbuilding industry was rapidly rehabilitated from its previous deteriorated condition, but subsequent expansion was slower although adequate to meet Soviet needs. Postwar plans call for considerable expansion under the supervision of the ministries of Shipbuilding and River Transport. The latter is responsible for the construction of wooden barges which compose the bulk of the fleet.

The majority of the inland yards are located on the Volga system with Astrakhan' and Gor'kiy having the largest concentration of building yards. Many large inland vessels, however, are probably built at seaport installations.

The quality of workmanship, including both repairs and new constructions, is generally considered poor.

(m) Strategic importance.—The waterways of European USSR are primarily important as carriers of essential commodities, especially oil and timber. They are, as now developed, unimportant as possible routes for naval vessels. Only the smallest seagoing types can move from the White Sea to the Baltic, and even these must make use of pontons and other special measures to utilize the canal. The White Sea – Baltic Canal does, however, shorten the water route from Leningrad to the White Sea by about 1,700 miles.

The long winter during which the rivers are frozen, and the dry summers during which the water levels are low combine to lessen the economic value of the rivers.

The relatively more important routes are selected and numbered on FIGURE I-11 and PLANS 22 to 25.

(n) Vulnerability.—The waterways, by reason of their relative unimportance in the USSR transportation system, would appear to be a secondary strategic objective except for those portions providing hydroelectric power and flood control. Proportionately the waterways suffered more damage than the railroads under German attacks, and reconstruction requires much longer time. Damage to waterways will affect particularly the movement of oil and timber and add a burden to the already overloaded rail system. Destruction of hydroelectric dams would reduce considerably the available power as well as impede transportation on some of the major navigable rivers. Breaking of water-impounding dams at some places would cause flooding of extensive areas, destruction of shipping, and inundation along the course.

Critical points include several major dams, the locks of important canals, bridges, port installations, shipping and maintenance fleets. The water network would be rendered largely inoperative if the two approaches to Moscow and the one to Leningrad were severed, the lock of the Dnepr dam destroyed, and the lower Volga made impassable. The dams controlling the waters of the Rybinsk reservoir would affect the levels of the entire Volga system in both directions.

Key railroad bridges are vulnerable points for both the waterways and the railroads.

Tankers and tugs are normally in short supply and their destruction would affect the water movement of oil which amounts to about 26% of the oil traffic.

(4) Petroleum and gas pipe lines

(a) General

1. PETROLEUM PIPE LINES (FIGURE I-11).—The Soviet Government realizes that the existing pipe lines supplying petroleum to European USSR are inadequate. In 1947, about 3,510 miles of pipe lines were supplying oil, as follows:

AREA	MILES
Northern Caucasus	1,440
Emba	625
Volga-Urals	1,140
Northern Russia	250
Western Ukraine	55
Total	3,510

Although the first two regions are outside the JANIS 40 area they are discussed for completeness. The Northern Caucasus supplies oil to Rostov-on-Don and Trudovaya and the Emba area is to supply Astrakhan' from Gur'yev when the double pipe line is completed.

Although the most important oil fields are connected by main or feeder lines to refineries or distribution points, the pipe lines transport only 25% of the crude oil extracted from the wells. The older pipe lines are reported to be in a very poor condition. As a consequence, in the last year of the Third Five-Year Plan (1942) about 60% of all crude oil transported and at least 90% of the byproducts were shipped by water or rail.

The 1942 planned total oil pipe-line capacity for the entire USSR was about 20,111,500 short tons. The average yearly pipe-line capacity per line is about 1,432,600 short tons. The line with the lowest yearly capacity is the 39-mile line leading from the Makhachkala storage tanks to the Izberbash railroad terminal in the Northern Caucasus, with 551,000 short tons.

2. GAS PIPE LINES (FIGURE I-11).—The longest and largest pipe line in USSR is the 500-mile, 13-inch diameter natural gas carrier from the Saratov gas fields on the Volga river to Moscow. The line, completed in 1946, has an estimated daily capacity of a little more than 45 million cubic feet. Other gas lines are in the Kuybyshev, Groznyy and L'vov areas.

(b) Detailed characteristics.—The entire oil and gas industry of the Soviet Union is government owned and operated under the Petroleum and Gas Division of the Ministry for Fuel, with each area under the local administration of a "trust".

1. PETROLEUM PIPE LINES.—The only information on the Northern USSR and Western Ukraine areas is the approximate length of the lines. Available data on the characteristics of lines in other areas are sketchy and lack pertinent information on type of construction, construction difficulties, gradients, descriptions of terminals and terminal facilities, pumping stations, equipment, and storage facilities. The location of fields and refineries, and planned, under-construction, and operating lines, with

diameter of pipe in centimeters are shown on FIGURE I-11.

a. Northern Caucasus.—Most of the operating pipeline mileage in this area, as in the Emba and the Volga-Urals areas, consists of pipe diameters of 7.9, 9.8, and 11.8 inches (20, 25, and 30 cm.). The 1940-built, Makhachkala-Groznyy-Armavir-Rostov-Trudovaya line, about 660 miles, consists of 9.8 and 11.8-inch pipe and has an annual capacity of about 1.65 million short tons. The old, 7.9-inch, Makhachkala-Groznyy-Armavir line was built in 1914 and has a capacity about half of the new line. The Goragorskiy-Groznyy line is about 35 miles long, of 13.8 and 15.7-inch pipe (35 and 40 cm.) and has an annual capacity of about 2 million short tons; it was constructed in 1938. The Malgobek-Mozdok 9.8-inch, 25-mile line was built in 1941 and has nearly 3 million short tons annual capacity. There is about 35 miles of 4 and 5-inch line, part of which at least was built in 1916.

b. Emba area (between the Ural and Emba rivers).—The 1940 built Gur'yev-Orsk line is 441 miles long and of 23.6-inch pipe with a 3 million short tons annual capacity. The largest diameter, 43.3 inches, comprises the 25-mile, Bol'shoy Peshnoy Ostrov-Gur'yev line; capacity is unknown. The 158-mile remainder consists of 12 miles of 7.9 and 146 miles of 9.8-inch line.

c. Volga-Urals area.—The oldest lines in this area were constructed in 1940. The diameters and capacities of the 12-mile, Naryshevo-Urussu station (near Tuymaza) line, and the 124-mile, Sterlitamak-Magnitogorsk line are unknown. The most extensive system is the 106-mile, five 20.7-inch lines, about 13 feet below the surface, located between Ishimbay and Ufa refinery; it was built in 1943 and has a reported capacity of 1.65 million short tons annually. The Astrakhan'-Saratov line is about 421 miles long and has an annual capacity of about 1.65 million short tons.

2. GAS PIPE LINES.—The 1947 operating gas pipe lines are shown on FIGURE I-11. Dimensions of pipe in centimeters are shown where known. Little information is available, even on the known lines:

LOCATION	LENGTH	COMPLETED
	Miles	*Year*
Saratov—Moscow	500	1946
Saratov—Yelshanka Pervaya	258	....
Pokhvistnevo—Kuybyshev	125	1943
Kuybyshev—Yablonovyy Vrag	20	1947
Malgobek—Groznyy	99	1945
Groznyy—Pravoberezhnoye	15	1946
Dashana—L'vov	37	....
Total	1,054	

The transmission line to Moscow from Saratov is about 6'6" underground and has six pumping stations with the first one about 27 miles from Saratov. The daily capacity of this line is about 151 million cubic feet. The daily capacity of the Malgobek – Groznyy line is 2.1 million cubic feet.

(c) Vulnerability.—Oil and gas transmission systems are generally vulnerable. Tank farms, open and other storage plants, terminals, pumping stations, and river crossings are critical points.

(d) Pipe lines under construction and planned (FIGURE I-11)

1. PETROLEUM PIPE LINES.—Before 1936, pipe-line construction was the responsibility of the Petroleum Pipe Line Construction Trust (Nefteprovodstroy). Probably a similar body still exists to perform large scale construction. Short lines are constructed by local trusts.

The extent of completion of the pipe lines under construction was indeterminable in late 1947. It is apparent, however, that the Soviet objective is to reduce rail and river shipments of oil to the Moscow and Western Ukraine areas. Eventually, the Trudovaya – Voronezh pipe line, either under construction or completed, with its planned extension will supply Moscow with about 4.4 million short tons per year. Oil lines to Astrakhan' from Makhachkala and Gur'yev are planned to reduce the Caspian Sea shipping. The proposed Astrakhan' – Kuybyshev line would improve control of oil transportation and reduce the number of oil tankers now required on the Volga river between these two points.

Petroleum pipe lines under construction 1941-1945:

LOCATION	APPROXIMATE MILEAGE
Trudovaya—Voronezh	250
Saratov—Kuybyshev	200
Saratov—Moscow	480
Syzran'—Kryazhim	75
Ufa—Tuymaza—Naryshevo	125
Dzhambay—Sor Ozero—Uil	95
Dossor—Ural'sk *	215
Astrakhan'—Gur'yev	565
Total	2,005

* Double pipe line (each about 282 miles) under construction in 1942.

Planned petroleum pipe lines:

LOCATION	APPROXIMATE MILEAGE
Trudovaya—Dnepropetrovsk	130
Voronezh—Moscow	295
Lozovaya—Khar'kov	95
Groznyy—Astrakhan'	250
Astrakhan'—Kuybyshev	500
Orsk—Ishimbay	195
Total	1,465

2. GAS PIPE LINES.—Planned natural gas lines are:

LOCATION	APPROXIMATE MILEAGE
Dashava—Proskurov—Kiev	325
Kohtla—Järve—Luga—Leningrad	165
Tula—Moscow	125
Total	615

The line from Dashava to Kiev will have an ultimate daily capacity of 176,572,000 cubic feet. The Kohtla-Järve to Leningrad gas line will be about 8 inches (20 cm.) in diameter.

B. Telecommunications

(1) General

The telecommunications facilities of the Soviet Union are a government monopoly under the Administration for Signal Communications (Narkomsvyaz, or People's Commissariat of Signal Communications). During World War II the civil and military administrations were practically the same. In either case administration is centered in Moscow (Moskva) with subdivisions following the political subdivisions of the country (FIGURE I-12).

The domestic network is less dense than in many other countries (about 0.75 telephones per 100 population in 1940); still it is possible for almost any community to communicate with Moscow. In general, the service is adequate for the needs of the country, since the main purpose of the domestic network is to provide official rather than private communication means. The primary means of international communication is by radio.

FIGURE I - 12

TELECOMMUNICATIONS

JANIS 40

EUROPEAN U.S.S.R.
STRATEGIC TRANSPORTATION SYSTEMS

Kilometers 200 0 200 400

100 0 100 200 Miles

CONFIDENTIAL

THIS MAP IS BASED ON MATERIAL AVAILABLE IN WASHINGTON, D. C., ON 1 JANUARY 1948

LEGEND

RAILROADS

Broad gage (5'0") — Steam — Electric

- Double track
- Double track in 1941, mostly single track in 1947
- Single track
- Single track, being made electric

Standard gage (4'8½")

- Single track
- Bridges over 75 and under 150 meters
- Bridges 150 meters and over
- Tunnels
- Strategic route numbers

CITIES AND TOWNS

- Over 500,000 population
- 100,000 to 500,000 population
- 10,000 to 100,000 population

OIL AND GAS

Oil pipelines:

- Operating, with diameter in centimeters where known
- Under construction
- Planned

Oil fields:

- Active
- Exhausted
- Oil refineries

Gas pipelines:

- Operating
- Planned

Gas fields

- Active

ROADS

(Classification based on 1941 German intelligence)

- All weather, asphalt or concrete
- Mostly all weather, good base, possessing crushed rock, cobblestone, or asphalt surfaces
- Seasonal, poor base or sub-grade; improved dirt roads
- Mostly seasonal, type of construction unknown
- Strategic route numbers
- Bridges over 75 and under 150 meters
- Bridges 150 meters and over

BOUNDARIES

- JANIS
- International
- Selected political
- Limit of farthest German penetration

WATERWAYS

- Depth classification, 0 to 1 meter
- 1 to 3 meters
- over 3 meters
- Canals
- Dredged channel
- Ferries and Locks
- Dams
- Existing
- Under construction
- Terminus of known river boatlines
- Ports
- Strategic route numbers

NOTES

Depth classifications are shown only for the Strategic Waterway Routes.

Streams without depth classification are navigable throughout most of their length.

[redacted] bridges, tunnels, ferries, and locks identified

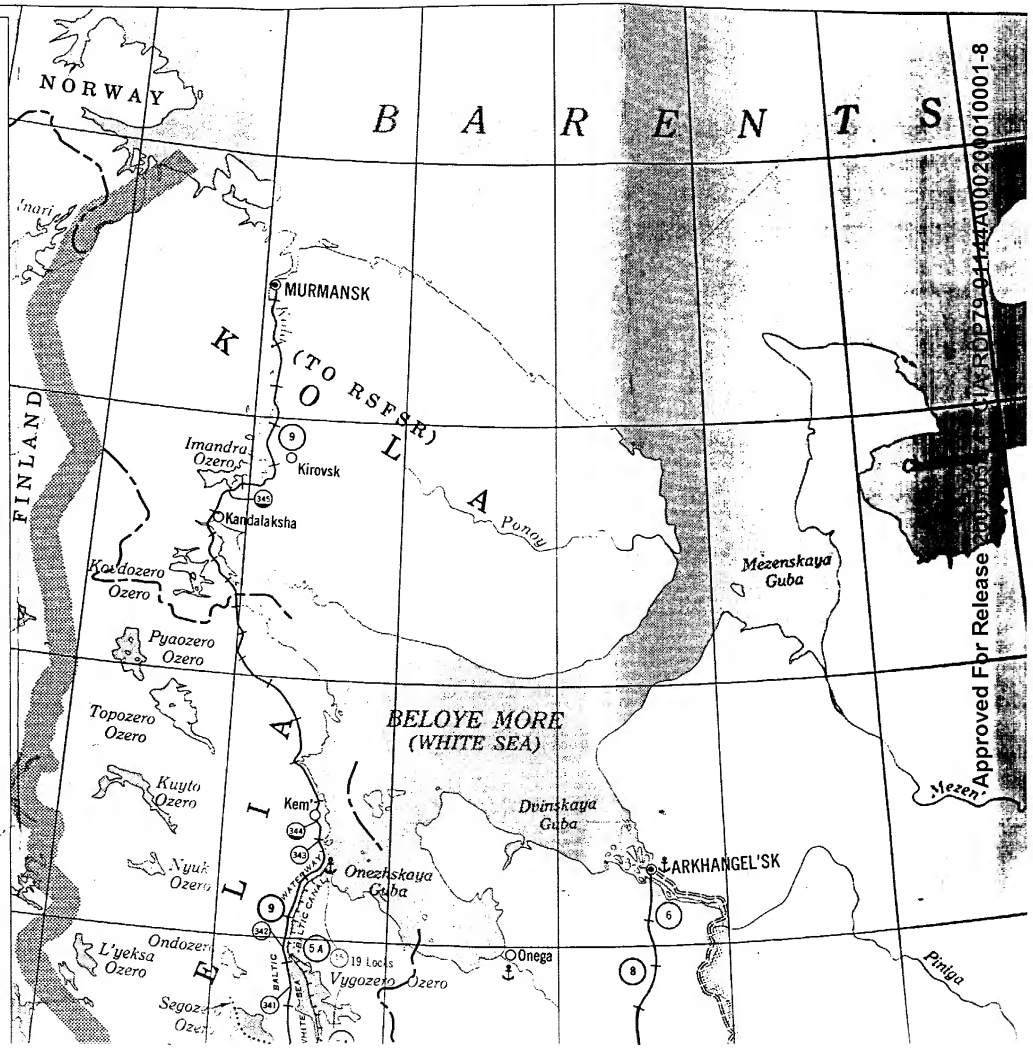
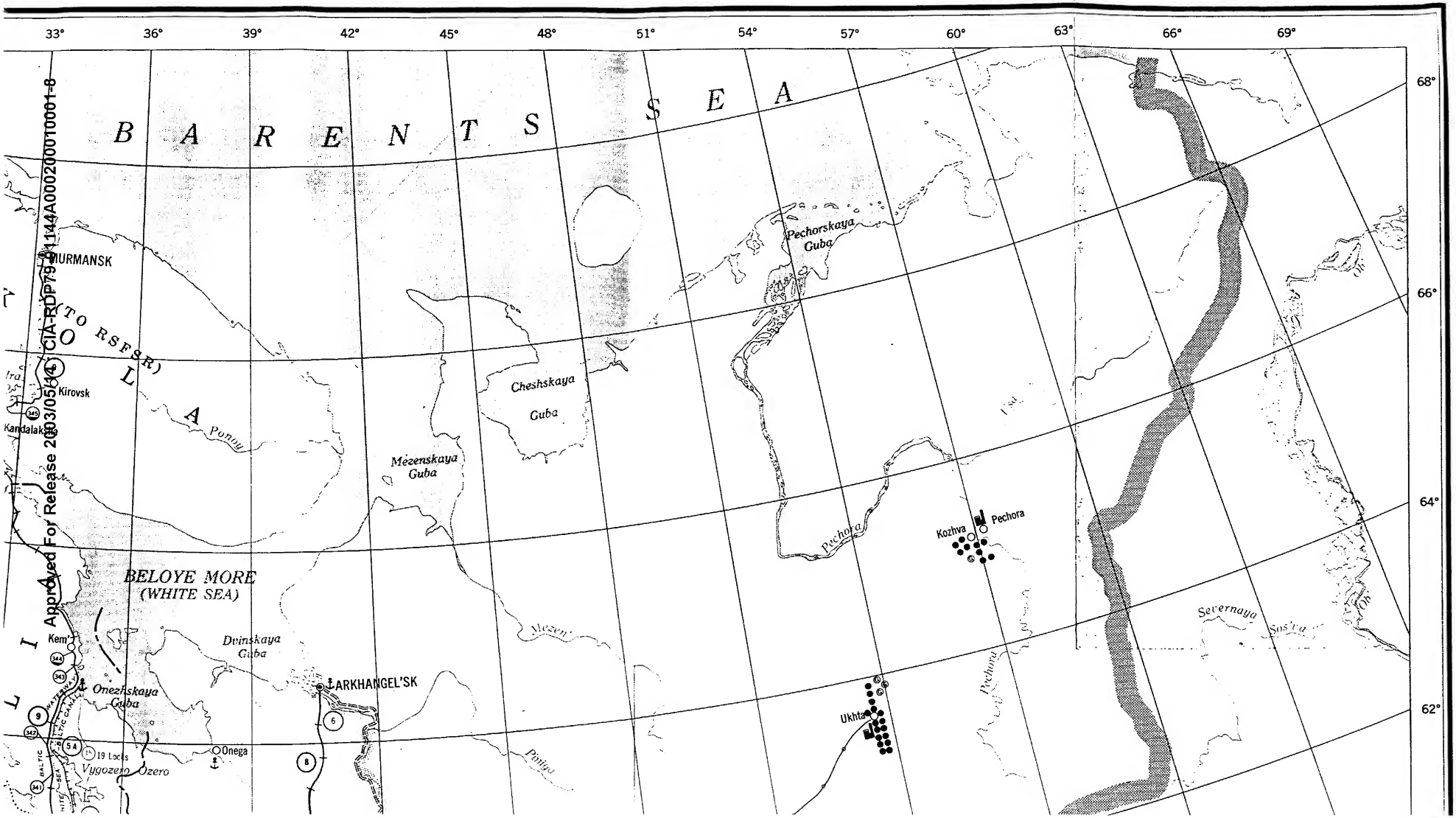


FIGURE 1-11
STRATEGIC TRANSPORTATION SYSTEM
JANIS 40
~~CONFIDENTIAL~~



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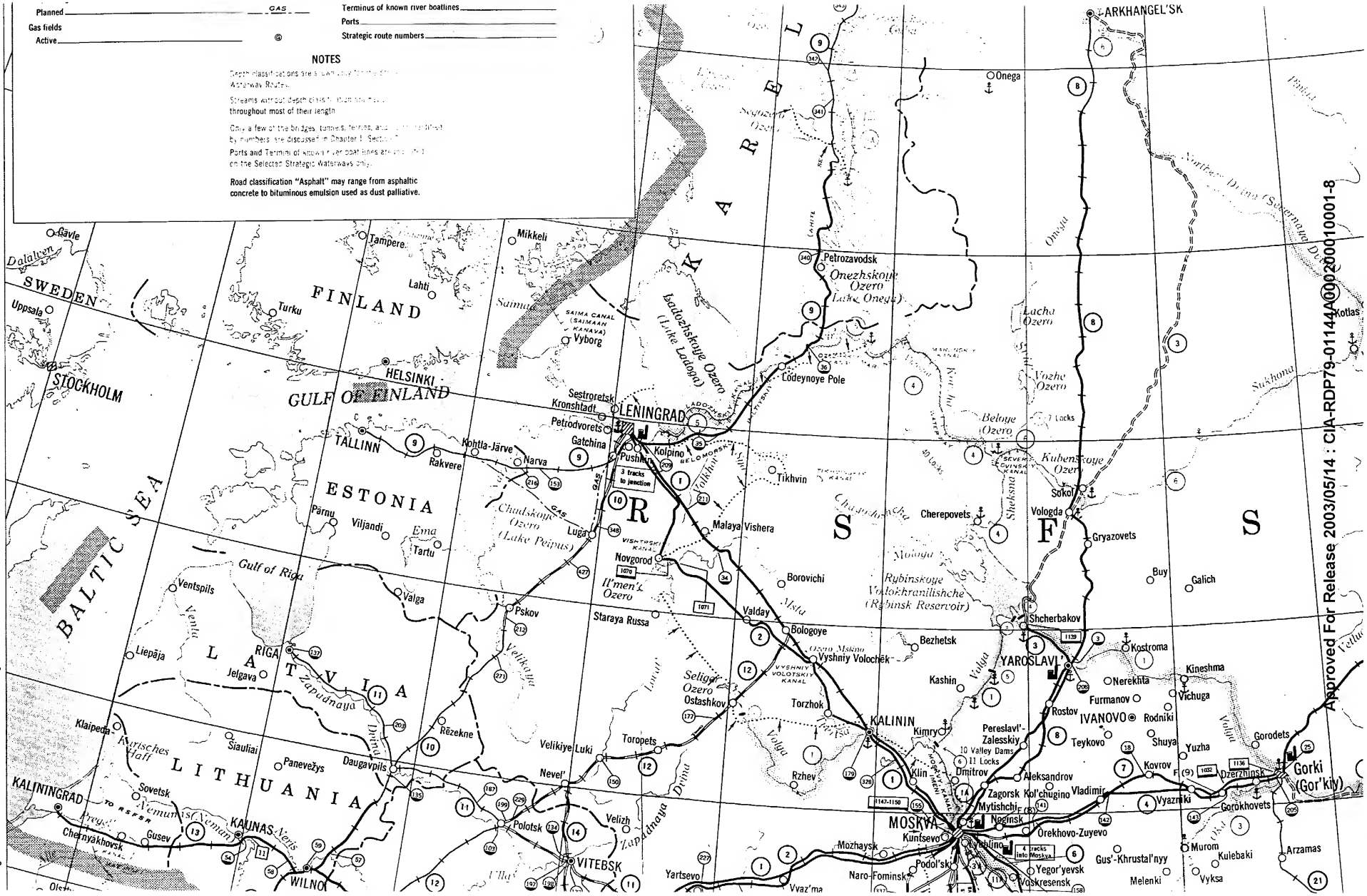

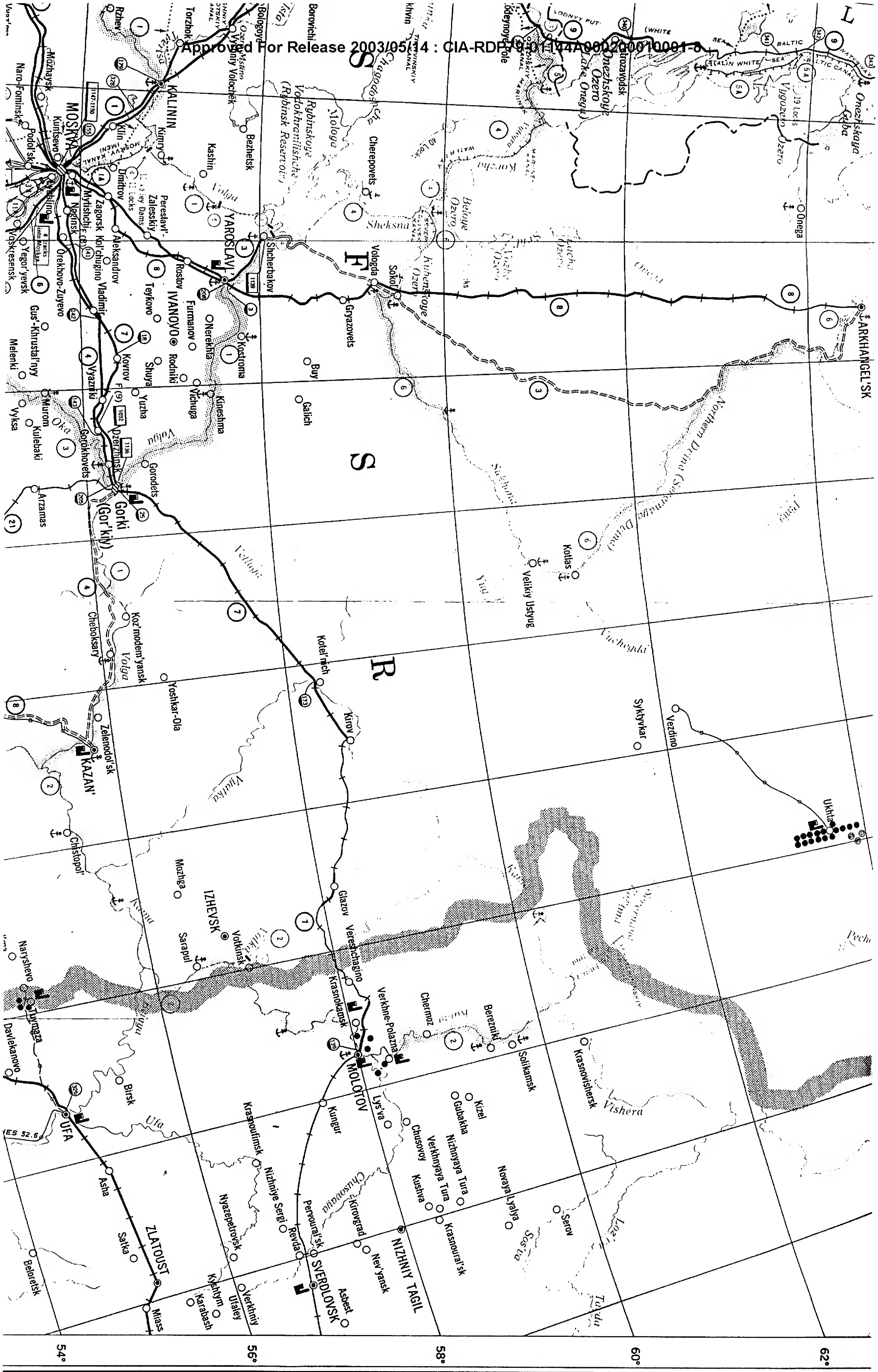

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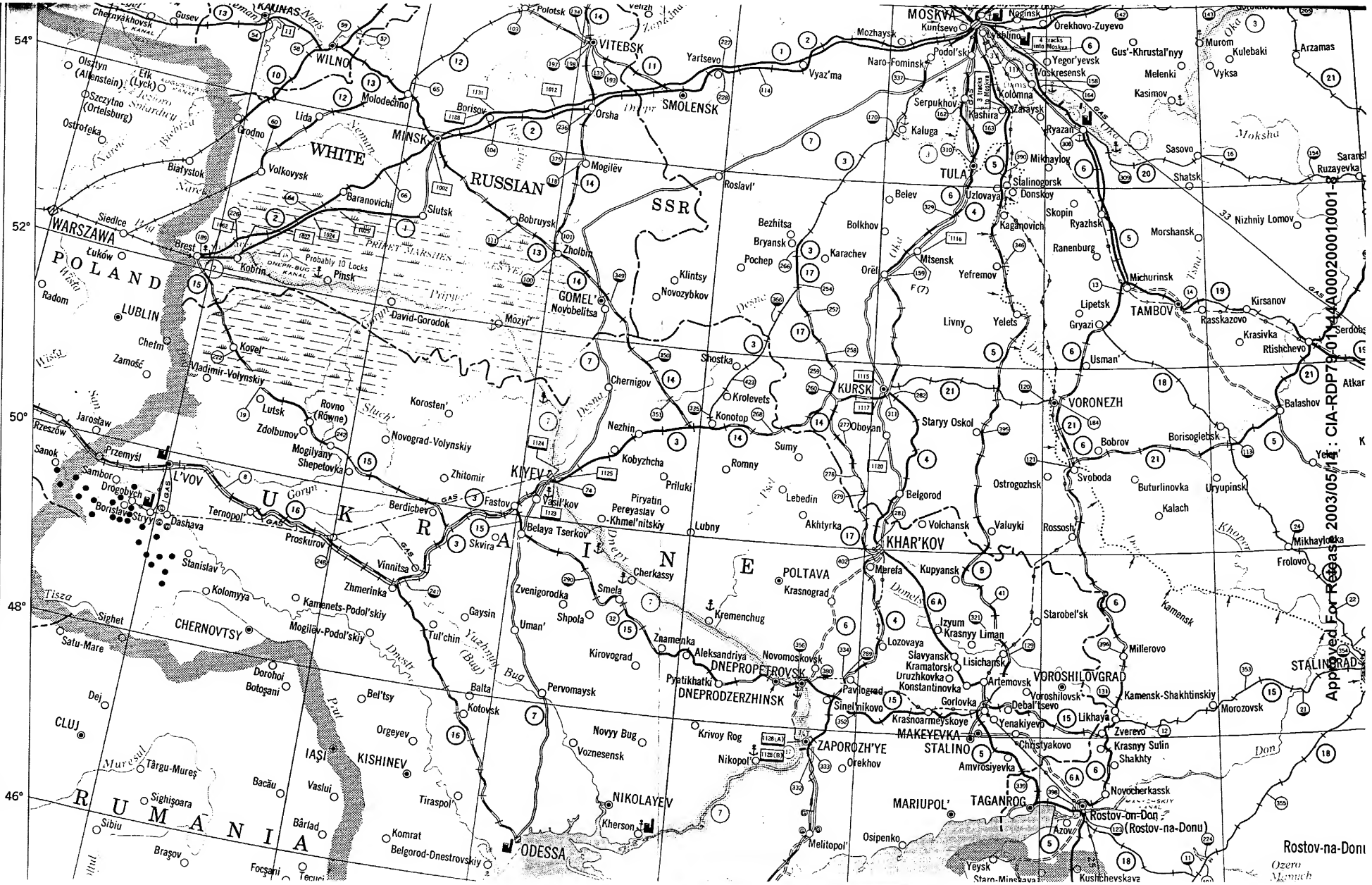

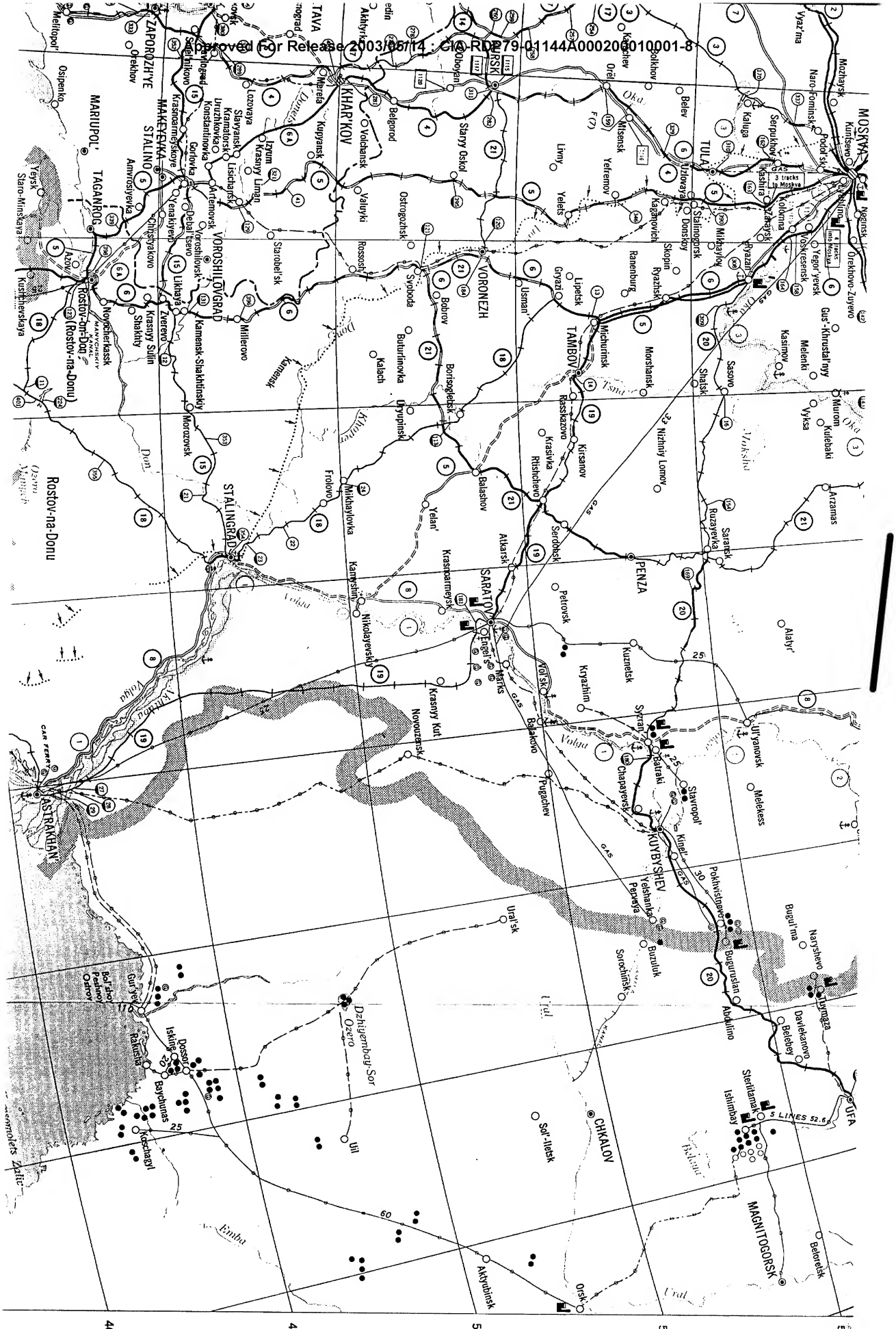

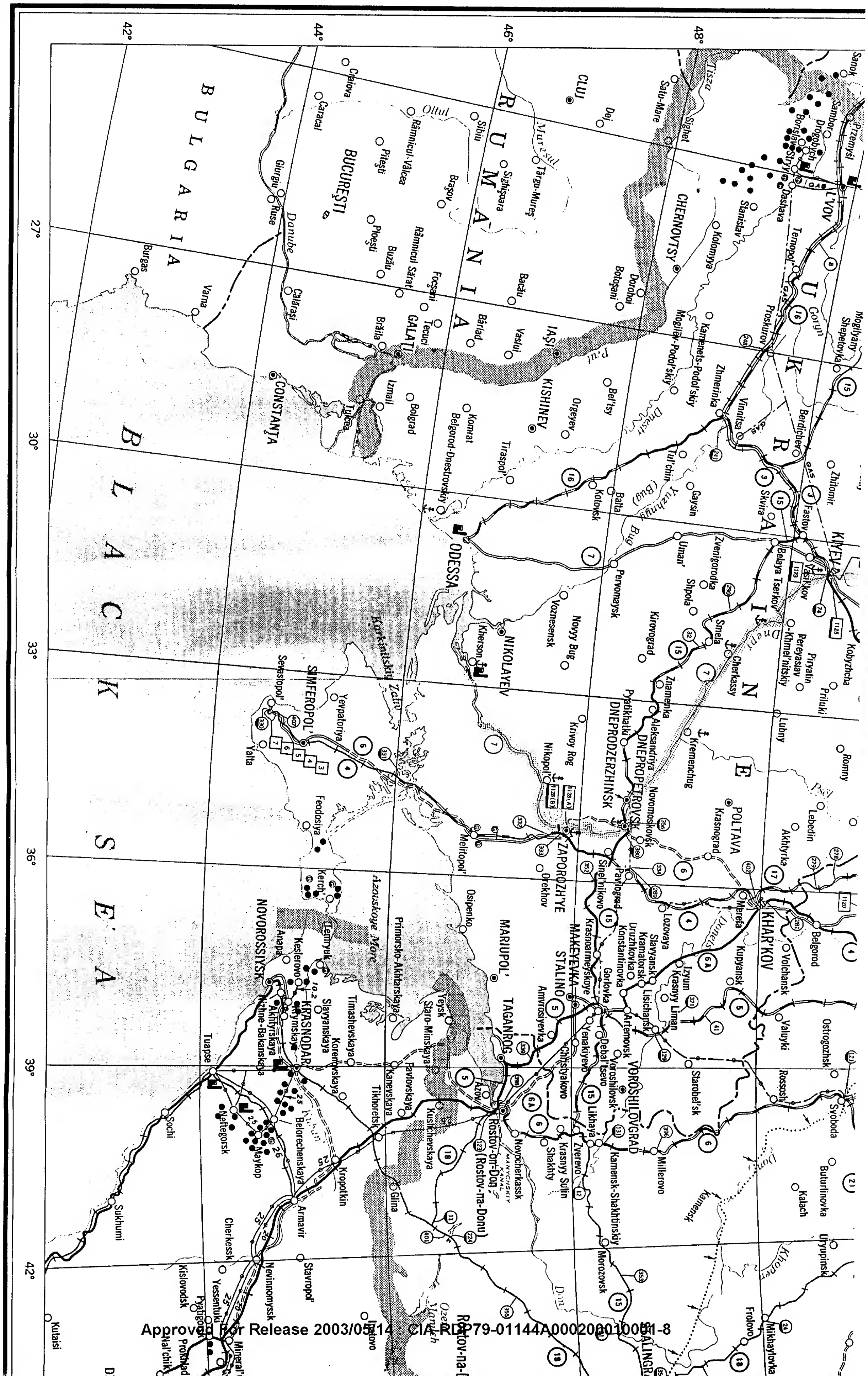

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ERS-AMS 6-48

To the extent permitted by production methods and facilities, the Russians prefer to use equipment of their own manufacture; however, much of the equipment which they do make is a modification of equipment which has been imported from other countries for that purpose. Some developmental work has been and is being done on television, frequency modulation, and high-frequency radio links; however, the present status of development is not definite. Radio amateurs are again being encouraged to operate, though kept under close government supervision.

(2) Domestic telecommunications networks

The domestic telecommunication system is organized along a "four-step plan". Moscow is the first step, with successively less important centers forming the other steps. Cross communication facilities between steps are limited except at the second-step level.

(a) Telephone.—Most of the intercity lines, as well as the lines in the smaller towns, are of the open-wire pole type. In many cases the telephone lines are on the same poles as the telegraph lines. In and near the largest cities underground cable is used quite extensively. A few of the intercity lines also are underground cables. Carrier is used on many circuits to provide the maximum possible number of channels. Maintenance is good, considering the methods used, but there is rather limited use of modern techniques, particularly as applied to line testing and fault location. Exchanges are being modernized and changed as rapidly as possible to automatic equipment, most of which is Ericsson Rotary.

(b) Telegraph.—The telegraph system is older and more extensive than the telephone system. The original telegraph lines followed the railroads, but as highways were built lines also were built along them, so that today telegraph service is available in almost all localities. Many different types of station equipment are used, including some American teletype which is well liked. Facsimile, either by wire or radio, is used when available since it alleviates difficulties caused by a lack of skilled operators and the use of more than one alphabet.

(c) Radio.—The domestic radio network is the most modern of the Soviet communication systems. Moscow, being the center of the communication system, is well equipped with all types of radio facilities. The main communication centers (step two of the four-step plan) usually have several first-quality transmitters, including one 15-20 kw. set, with features including multichannel high-speed telegraph and telephone facilities, and crystal control for several frequencies. The smaller communication centers have less powerful equipment. Many otherwise isolated communities are linked with the wire network by means of low-power radio stations. Much of the radio equipment is Soviet-made and is quite modern in design. Early in 1946 it was reported that a very high-frequency radio telephone circuit was being constructed from Moscow to Leningrad, and another from Moscow to Gor'kiy was being planned.

In addition to the regular communication stations there are other government-operated radio services, such as aviation facilities, ship-to-shore and navigational-aid stations, police stations, meteorological stations, and railroad communication systems.

(3) International telecommunications networks

(a) Radio.—In 1940 there were about 15 short-wave radio stations in European USSR which were used for international communication. The most important were those near Moscow, although other stations were more favorably located for communication with the United States and Canada. In addition, there were long-wave stations at Leningrad, Kiev, and Khar'kov.

(b) Telephone and telegraph.—Prior to World War II there were trunk lines from Moscow to the important cities of other European countries; most of these circuits have been re-established. The few submarine cables that are used are two to Denmark, four to Finland, and one to Turkey.

(4) Broadcasting

The government-operated broadcasting system of the Soviet Union differs from that of most other countries in that greater emphasis is placed on the use of a wire-distribution system than on the use of receivers for direct listening. In the entire USSR there are about 5½ million speakers connected to this wire system. During the war all receivers were confiscated but they are now being returned, and the production of home-type receivers has been resumed.

Most of the broadcast station equipment is of Soviet manufacture. The wire-broadcasting system is similar to a power-distribution network with local amplifiers up to 24,000 watts used in some stations. The radio broadcast stations are frequently used as relay stations for programs originating in Moscow for distribution in other localities. Since the war several transmitters have been reconstructed and some new stations built.

Receivers are licensed by the government. The most popular prewar model was a copy of a 1936 RCA. Since World War II, production has been resumed on several 5- to 7-tube models with dynamic loudspeakers, some of which are made for battery operation.

8. CITIES AND TOWNS

A. General description

(1) Introduction

European USSR is the European portion of the USSR with revised postwar boundaries, but excludes the Caucasus. It includes all of Estonia, Latvia, and Lithuania, and areas annexed from Finland, East Prussia, Czechoslovakia, Poland, and Rumania (FIGURE I-13). This area also includes 53 cities and towns with prewar populations of 20,000 and over, 30 of which were in the area occupied by the Germans and suffered much structural damage. Some of the 23 cities in the unoccupied area, including Moscow (Moskva) *107* * and Leningrad *37*, both of which were near the front lines, suffered extensive damage by bombardment. In both of the cities mentioned, reconstruction centers around opening major arteries and eliminating points of congestion.

The area of European USSR is mostly low-lying, nearly level or gently undulating plain. Wide river flood plains border most of the streams, but many of the larger rivers flow at the foot of eastward-facing bluffs as much as several hundred feet high. Most of the larger cities are situated on bluffs overlooking strategic river crossings. Gullies dissect the bluffs and divide the communities into several parts. Although obstacles to lines of communication, such gullies may be useful as routes from high levels down to the river, or for defense.

* Major cities are identified by italicized numbers throughout the text and by underlined numbers on FIGURE I-13; minor cities are identified throughout by numbers in parentheses.

(2) Pattern and urbanization

Russian internal communications prior to the revolution of 1917 were inadequate, even for the predominantly agricultural economy of that time. The rivers were the principal carriers of freight, and nearly every urban center of importance was located on one of the major rivers. The intense industrialization which occurred between 1917 and 1940 was accompanied by a considerable increase in railroad mileage. However, little effect was seen in highways, except around Leningrad and Moscow.

Odessa *238*, Sevastopol' *246*, and other cities on the Black Sea coast, and Murmansk *3* with its satellites on the White Sea (Belcye More) have become major seaports.

Areas incorporated in the USSR since World War II do not conform to the general pattern of urbanization, as they differ in racial origin and history. Most of the major urban areas, such as Rīga *86* and Kaliningrad (Königsberg) (263) are seaports.

(3) Degree of urbanization

Prewar industrialization resulted in extensive population shifts from rural to urban areas and brought about considerable overcrowding even prior to the invasion. As a result of subsequent destruction and the fact that reconstruction cannot be effected immediately, a large percentage of urban areas are now seriously overpopulated. This is particularly true of Moscow and Leningrad.

It is difficult to evaluate the effects of the war on urban areas, as numerous shifts of population have occurred. Industrial populations were moved eastward to the Urals and Siberia during the war. The populations of areas annexed since the war have been shifted elsewhere and Russian populations introduced. The German inhabitants of the former German Volga ASSR have been moved to western Siberia and USSR middle Asia, but their influence is still seen in Engel's *193*, Marks (Marksshstadt) *194*, Kuybyshev *130*, and even the rural areas.

(4) Functions

The major urban areas of European USSR are of comparatively recent origin. Moscow was a small village in the twelfth century, and Leningrad was founded in the seventeenth century. Many cities were built around a *kreml'* (citadel), or kremlin, which, in many instances, is still standing. However, the trend to industrialization has altered city patterns. Many cities, such as Moscow *107*, Gor'kiy *58*, Kuybyshev *130*, and Leningrad *37*, are now centered around industrial plants. Stalingrad *197* extends about 50 kilometers (31 miles) along the Volga river, a waterway of considerable importance to its industries.

(5) General characteristics

Prior to the revolution, urban areas were normally spread out, comprising few buildings over two stories in height but with numerous detached wooden structures with fenced gardens or yards. Despite overcrowding, such areas have low population densities and low percentage of land occupied by structures. Areas developed during the Soviet regime or acquired by annexation are more heavily built-up.

Street plans are usually gridiron, sometimes combined with a radial plan, as in Moscow. Some modern main streets are wide and well paved. Such construction has often necessitated drastic measures in widening and straightening the rights-of-way. However, dirt surfaces are the most common. The traveled way wanders, according to the condition of the road surface, along a wide public or open strip marked off by garden fences. The better main streets are paved with cobblestones. The smaller communities, many of which are bisected by streams, are often bottlenecked by inadequate bridges and by narrow, winding streets. In many villages, the main street is part of the dirt road which constitutes the only access route.

For the most part, urban areas are not divided into sections based on racial or religious differences. Certain areas, such as that of the now nonexistent German Volga ASSR, have characteristics attributable to specific racial groups, although the original inhabitants have been relocated. Areas annexed since the war retain such characteristics.

Notable growth in hospital facilities was accomplished between 1913 and 1941. In the latter year, there were 491,543 hospital beds in the cities of USSR as a whole, an average of 8.2 per 1,000 population. There were 24,792 out-patient clinics and a trend toward expansion of these facilities. Technical equipment is poor. Doctors are lacking, but latest reports indicate that medical schools are currently crowded. The most common diseases are malaria, tuberculosis, and dysentery. Sand-fly fever is limited to Krymskaya Oblast' (Crimean Oblast). Although progress has been made in retarding the more common diseases, the incidence of tuberculosis and venereal disease is high.

Rural hospital beds in the entire USSR numbered only 169,888 in 1941, or 1.47 beds per 1,000 population. Rural medical centers numbered 13,512. Technical equipment is poor. Bacillary dysentery and common diarrheas are widespread in rural areas.

Only 107 cities had sewerage systems in 1938. Sewerage mains totaled about 5,000 kilometers (3,100 miles). Little information is available on garbage and trash collection. Leningrad has a planned system of collection, and large industrial plants and adjoining communities have provided their own systems. Small villages have no modern sewerage or systematic garbage-disposal systems.

Water-supply systems were in operation in 411 urban areas of the USSR in 1938. The 14,000 kilometers (8,700 miles) of water mains included primitive types made of hollow logs. Villages obtain most of their water from wells, often of poor design and construction. Use of concrete construction has been encouraged around Moscow and Pskov (81).

Except in those communities with their own generating equipment, electric power for domestic consumption is limited by industrial demands. Natural or artificial gas is available for domestic or industrial use in most of the larger towns. Few villages have electricity, but some large farms have their own generating plants. Gas is available to some villages.

The most important structure in an urban area is usually a government building. The railroad stations on the older lines are also of considerable importance. Commercial buildings, as found in the United States, are located only in the most important cities, such as Moscow, Leningrad, and Khar'kov.

Prewar residential construction conformed to the following several fairly definite patterns:

a) Rectangular blocks with buildings forming a continuous front along the building lines on all four sides, with uniform cornices and pitched roofs, and small interior courts (Moscow, Leningrad, Odessa). Structures occupy 70% to 80% of the available space.
b) A variation of the first type with breaks between adjacent structures, and its interior courts open on one side. Structures occupy 50% to 70% of the block.
c) Groups of rectangular multidwelling structures erected on areas within the confines of the block embodying other types of construction.

d) Several storied structures with numerous dwelling units. The usual gridiron of alternating major and minor streets is discarded in favor of an irregular arrangement.
e) Rectangular blocks with deviations from this pattern as required by terrain. Large buildings occupy business section and residences are detached but closely spaced, and have pitched roofs.
f) Closely spaced detached residences facing outward on the two long sides of the block, with occasionally one or two on the short sides. Each house has a garden.
g) Smaller and poorer houses with larger gardens, fronting on two long sides of the block. Mostly on the outskirts of cities and towns.
h) Small wooden residences in a row fronting on the long sides of the block, each with a plot of land. Chiefly in the older communities of eastern and southeastern European USSR and Ukrainian SSR.
i) Simple forms of construction in the smaller villages along the roads, trails, and streams of the USSR (except in recently annexed areas), consisting of small detached residences arranged in a row along the road or stream, each with a garden in the rear. Although the majority of houses are of wooden construction with tile or sheet-metal roofs, many are constructed of sun-dried brick or pounded earth, and have thatched roofs.

(6) War damage

War damage was most extensive in the occupied areas. The utilities, transportation, and industrial facilities were systematically destroyed. Residential areas were widely burned out. However, specific information on war damage is generally inadequate. In the plans for reconstruction more extensive use of concrete can be expected.

(7) Major urban areas

Six of the seven largest cities of the USSR are located in European USSR, exclusive of the Caucasus; these are Moscow, Leningrad, Kiev *171*, Khar'kov *208*, Gor'kiy *58*, and Odessa *238*.

(8) Minor urban areas

Three-fifths of the minor urban areas lie in the occupied zone. They follow the general patterns of the larger urban areas.

(9) Analysis of small towns, villages, and farms

The smaller urban units of European USSR, conform to a fairly standard pattern. They vary in proximity in accordance with the population density of the area. In Ukrainian SSR, it is often difficult to determine the lines of separation.

The large villages may occupy a greater area than the small towns, but the latter usually have a greater population density. The villages consist of widely separated houses, each with its individual garden or farming area. The towns have much less space between houses and much smaller garden plots.

Isolated farmsteads were almost completely lacking in prewar USSR, although they did exist in western areas subsequently annexed.

Certain variations from the standard pattern are found in particular geographic areas. In the north and northeast, above 65°N, the communities other than Murmansk *3* and similar boom towns are small. They are usually confined to clearings in the evergreen forests, except for those located in the tundra region of the far north. They are often located on the banks of lakes on other navigable waterways. Most villages are dependent on fishing.

In the areas acquired from Finland, particularly the Karelian Isthmus northwest of Leningrad, residential construction is more substantial and more elaborate than the Slavic types. Neatness and cleanliness are a characteristic of the areas.

The urban areas of the Baltic states are middle or western European or Scandinavian in character. Masonry, particularly brick, is used to a considerable extent in the towns and, to some extent, in rural areas. Rambling villages and individual homesteads, similar to those of the eastern United States, are common throughout much of the area. However, a transition to the Slavic communal type of farming, evidenced by regimented rows of rural buildings, occurs in southern Lithuania and in White Russian (Belorusskaya) SSR.

The southern part of White Russian SSR, is densely populated by comparison with the northern part, where there are few, but often large communities. Residences are mostly of wooden construction with thatched roofs.

The Ukrainian SSR has a heavy population density. Small communities are very numerous and closely spaced, frequently constituting a continuous line of development for considerable distances along minor river valleys. Most smaller communities are open in design, but the older sections of cities and towns are more compact. Recent expansions on the outskirts of major urban areas are usually regular in pattern.

The Black Sea coast from Rumania along Krymskaya Oblast' (Crimean Oblast) is rocky or mountainous, with numerous lakes and estuaries of major rivers. Because of the difficulties of land travel, most communities are situated on a waterway or on the coast. Krymskaya Oblast' is the most mountainous. Its villages are located in the valleys and numerous villas are strung along the coast. Throughout the area, but particularly in Krymskaya Oblast', the population is concentrated in the cities and towns. Mediterranean influences are apparent in local architecture, and many structures possess oriental or Turkish features of design or ornamentation. Masonry structures with stucco finish and low-pitched Spanish tile roofs are numerous. Stone walls are used in place of wooden fences. The entire area is a recreation center for the USSR.

The dry steppes between the lower Don and Volga rivers have a sparse rural population, and villages are small and far apart. Towns are usually located on a major river and follow a compact gridiron pattern. Because of the scarcity of wood, most small residences are built of sun-dried brick or pounded earth.

Although its original German population has been deported to the east, the lower Volga basin is characterized by structures of German type, adapted to Russian materials. Residences and outbuildings surround courtyards and are enclosed in wooden palisades. Living quarters are mostly well built and neat in appearance, often consisting of two-story structures with masonry walls and wooden gable ends. Roofs have a steep pitch, often with hipped gable peaks. Clay tile roofs and brick chimneys are common. Multifamily apartment buildings are found in the cities.

B. Occupied area

(1) Introduction

The line of farthest German penetration passed through or near a number of urban areas, including Sestroretsk (25) Novgorod (80), and Voronezh (181). It approached, but did not take in Moscow, Leningrad, and Tula *110*. The German armies were held to the Don river southward as far as Stalingrad, where the Don was crossed and Stalingrad was entered. Southward from Stalingrad, isolated patrols penetrated as far as 46°E (FIGURE I-13).

The cities and towns of the occupied area often became major battlegrounds. Typically, they are located on high

banks of major rivers and command strategic crossings. Cities such as Smolensk *103,* Kiev *171,* and Khar'kov *208* were, therefore, vigorously defended and suffered extensive damage before Russian evacuation. Although the Germans restored some facilities for their own use, they put a systematized plan of total destruction into effect before their retreat. Smolensk had only 40 buildings standing when recaptured by the Soviet army.

Equipment left behind in German-occupied areas was either taken westward or destroyed before the German retreat. Moreover, in accordance with the current Soviet policy of developing eastern industry, the plant equipment evacuated eastward under wartime emergency will probably never be returned to those plants. In view of these factors, it appears that much new equipment will be needed and that a general modernization can be expected.

The occupied area is, as a whole, the more densely populated part of European USSR, and it includes a majority of the urban areas. It takes in the westernmost SSR states and Ukrainian SSR. Occupied cities of Ukrainian SSR, include Kiev *171,* the capital; Khar'kov *208;* Odessa *238,* the most important Black Sea port; and Dnepropetrovsk *210.*

The large urban population of prewar Ukrainian SSR and White Russian SSR was distributed among numerous closely spaced towns. A limited arc south of Leningrad had a high population density. Urban areas of the southeastern steppes were mostly located in the river valleys or grouped at strategic points.

Villages are generally characterized by features incident to the communal system of farming.

(2) Major cities and towns (TABLE I-7)

Thirty cities and towns of the occupied area had populations of 30,000 or more in 1941. The largest city, with a population of 850,000, was Kiev *171,* the capital of Ukrainian SSR. This city was noteworthy as a commercial center, a naval base, and a rail and road junction.

The second largest city, Khar'kov *208,* was being developed into one of the major USSR industrial centers before the invasion. Eighty percent of its factories were destroyed.

Odessa *238* was the most important Black Sea port and a water-rail transshipment point. Most war damage in the port area was repaired by 1946.

Prewar sea and river ports, which were generally subject to extensive damage, included Rostov-na-Donu *256,* Stalingrad *197,* Rīga *86,* Taganrog *254,* Nikolayev *240,* Tallinn *27,* Simferopol' *245,* Liepāja *90,* Klaipėda *260,* and Vyborg *24.*

Prewar metallurgic industries had been developed at Kursk *177* and Stalino *252,* where local deposits of coal and iron were available, and at Zaporozh'ye *250* and Kramatorsk *203.*

Several cities and towns, such as Rostov-na-Donu, Rīga, L'vov *227,* Taganrog *254,* and Chernovtsy *223,* were primarily of commercial importance, although most had some local industry. The border city of Brest *164* derived its importance from its rail connections.

Because of their location, Dnepropetrovsk *210* and Stalingrad have been important lumber centers, and Simferopol', Kursk *177,* and Orël *145* have been important agriculturally.

Most cities had some prewar industrial facilities. The following had substantial numbers of factories, though varying considerably in importance: Rostov-na-Donu, Dnepropetrovsk, Stalino *252,* Minsk *155,* Kalinin *74,* Voroshilovgrad *201,* Vil'nyus *92,* Nikolayev, Smolensk *103,* Tallinn, and Stanislav *226.*

TABLE I - 7

MAJOR URBAN AREAS IN OCCUPIED AREA

(This table lists only the known data. Many towns may have other facilities not listed herein.)

Figure I-13 Index No.	Name, coordinates, population	Geographical characteristics	Means of access and internal transportation	Resources and trade	Health, hospitals, and billeting	Utilities and telecommunications	Remarks
164	Brest (Brześć nad Bugiem, Brest Litovsk) 52°06′N, 23°41′E Pop. 54,200 (1937) 50,000 (Dec. 1940 est.)	On the right bank of the Bug river at the mouth of the Mukhavets river Brestskaya Oblast'; White Russian SSR	Rail: Important junction of the lines from Warsaw (Warszawa), Poland; Bialystok, Poland; Baranovichi, and Kovel'. 3 R.R. bridges over the Mukhavets. Road: Junction of highways from: Warsaw, Poland; Bialystok, Poland; Kobrin, and Kovel' Air: Airfield	Varied light industries	3 hospitals Former Polish military hospital 38 schools	Power plant (5,000 to 25,000 kw.) R.R. power plant 244 kw. Water tower Water mains Sewers Post, telephone, and telegraph office Broadcasting and one other radio station	Oblast capital and fortress Expanded belt of forts, old fortified citadel
223	Chernovtsy (Cernăuți, Czernowitz, Chernovitsy) 48°17′N, 25°57′E Pop. 112,000 (1937)	On a 60-m. (197-ft.) high terrace over the Prut valley. Chernovitskaya Oblast', Ukrainian SSR	Rail: Lines to Kolomyya, Chortkov, Lipkany, and Glyboka (station at Adynkata) Road: Roads to Zastavna, Khotin; Dorohoi, Rumania; Siret, Rumania; and Storozhinets Air: 2 airfields	Varied industries (including oil refining)	10 hospitals 2 sanatoria 6 hotels 12 barracks University 18 schools Public buildings	1 power plant (oil-burning), 6,820 kw. Post office Commercial aviation radio station Police radio station 7 lines (and amplifier station) on telephone-telegraph network N, E, ESE, SE, S, SSW, and NNW	Oblast capital

210	Dnepropetrovsk (formerly Yekaterinoslav) 48°27′N, 35°03′E Pop. 500,700 (1939) 600,000 (1946 est.)	On the right bank of the Dnepr river Dnepropetrovskaya Oblast', Ukrainian SSR	Rail: Connections with the Donets Basin and Kherson Road: Hwys to Khar'kov, Nikopol', Zaporozh'ye, and Krivoy Rog Air: 5 landing fields Water: River port Railroad and combined railroad-highway bridges over Dnepr.	Large-scale industry (chiefly iron and steel)	Hospitals Sanatoria Hotels Schools	Steam power plant (30,000 kw.) Post office Radio telegraph station 3 lines on the telephone-telegraph network, E, SW, and W Broadcasting station 4 other radio stations	Oblast capital
74	Kalinin (formerly Tver) 56°52′N, 35°54′E Pop. 216,100 (1939) 216,000 (1941 est.)	On both banks of the Volga and of its tributaries, the Tvertsa and the T'maka Kalininskaya Oblast', RSFSR	Rail: Lines to Moscow and Bologoye Road: Hwys to Moscow, Bezhetsk, Torzhok, Rzhev, Volokolamsk, and Pokrovskiy Air: Airfield and 2 landing fields Water: River port	Varied heavy and light industries	Hospital 2 hotels Barracks Military schools Public buildings	2 power plants (total 34,000 kw.) Post, telephone, and telegraph offices Radio telegraph station Broadcasting station	Oblast capital
208	Khar'kov (Charkow) 49°59′N, 36°17′E Pop. 835,000 (1941) 950,000 (1946)	At confluence of the Lopan' and Khar'kov rivers Khar'kovskaya Oblast', Ukrainian SSR	Rail: Lines to Belgorod, Moscow, Kupyansk, Chuguyev, Krasnyy Liman, Dnepropetrovsk, Lozovaya, Poltava, and Lyubotin Road: Hwys to Belgorod, Volchansk, Chuguyev, Zmiyev, Merefa, Poltava, and Bogodukhov Air: 8 airfields	Varied heavy and light industries 50% of Ukrainian industry (prewar)	23 hospitals Sanatorium Rest home Hotels Barracks Military schools University Public buildings	3 power plants (total 119,000 kw.) Post office In telephone-telegraph network Radio telegraph station Broadcasting station	Oblast capital
171	Kiev (Kiyev, Kiew) 50°26′N, 30°31′E Pop. 850,000 (1941) 650,000 (1946)	On the right bank of the Dnepr Kiyevskaya Oblast', Ukrainian SSR	Rail: Lines to Poltava, Nezhin, Chernigov, Korosten', Fastov, and Vasil'kov Road: Hwys to Chernigov, Oster, Vyshgorod, Gornostaypol', Gostomel', Zhitomir, and Belaya Tserkov' Air: 3 airfields Water: Steamer ferry across the Dnepr	Varied heavy and light industries	3 hospitals Clinics 11 hotels Barracks University Schools Public buildings	5 power plants (all destroyed) Post office In telephone-telegraph network 2 broadcastng and 16 other radio stations	Oblast capital
260	Klaipėda (Memel) 55°42′N, 21°10′E Pop. 38,500 (1937)	On the sound connecting the Kurisches Haff and the Nemunas (Neman) river with the Baltic Sea Lithuania	Rail: Lines to Sovetsk (Tilsit) and Kaunas Road: Roads to Sovetsk (Tilsit), Kaunas, and Liepāja. Air: Airfield Water: Seaport	Varied heavy and light industries	Leprosarium Orphanage Advanced schools	Power plant (4,500 kw.) Gas works Coastal radio station Waterworks	
203	Kramatorsk (Kramatorskaya) 48°44′N, 37°32′E Pop. 93,350 (1939)	On a small river, the Kazennyy Torets; NW of Artemovsk Elevation: 100 m. Stalinskaya Oblast', Ukrainian SSR	Rail: Lines to Stupki, Konstantinovka, and Slavyansk Road: Hwys to Konstantinovka and Slavyansk Air: Airfield Internal: Streets in poor condition	Varied large-scale industries	.....	3 power plants (50,000–100,000 kw.) 3 lines on telephone-telegraph network, N, ESE, and SSE 2 radio stations	Explosives dump Industrial development rather recent 5,500 dwellings in 1939 Generally gridiron street pattern Built-up area 8½ sq. km. Oblast capital
177	Kursk 51°45′N, 36°12′E Pop. 120,000 (1939)	On two hills on the right bank of the Tuskor' river Kurskaya Oblast', RSFSR	Rail: Lines to Voronezh, Orël, Khar'kov, and Kiyev Road: Hwys to Orël and Khar'kov Air: 3 airfields	Varied heavy and light industries	4 hospitals 5 hotels Barracks Military aviation school	Power plant (24,000 kw.) Water tower Post, telephone, and telegraph offices Radio station for air service Broadcasting station	

TABLE I – 7 (Continued)

Figure I–13 Index No.	Name, coordinates, population	Geographical characteristics	Means of access and internal transportation	Resources and trade	Health, hospitals, and billeting	Utilities and telecommunications	Remarks
90	Liepāja (Lepaya, Libau, Libava) 56°31′N, 21°00′E Pop. 57,000 (1935)	Located on the narrow strip of land between the Baltic and Liepājas Ezers (Liepāja Lake) Latvia	Rail: Lines to Alsunga and Rīga Road: Hwys to Zieumpe, Rīga, Saldus, Jelgava, and Rucava Air: 2 airfields and seaplane landing Water: "Municipal canal" connects with Baltic. Liepāja is ice-free practically all year Internal: Streetcar system. Large swing bridge in military harbor, 15 m. wide	Varied heavy and light industries	Hospital Sanatorium 3 hotels Boarding houses Military hospitals Officers' quarters (now general billet) Barracks	Gas works Power plant (13,000 kw.) Post, telegraph and telephone office 3 radio stations Broadcasting station 3 submarine cables	Belt of forts
227	L'vov (Lwów, Lvyv, Lemberg) 49°56′N, 24°02′E Pop. 317,800 (1937)	On the Pel'tev river, a tributary of the Bug L'vovskaya Oblast', Ukrainian SSR	Rail: Lines to Kovel', Brody, Ternopol', Stanislav; Przemyšl, Poland; Krakow, Poland; Yavorov, and Rava-Russkaya Road: Hwys to Rava-Russkaya, Lutsk, Ternopol', Brody, Stryy, Sambor; Przemyšl, Poland; and Yavorov Air: 2 airfields	Varied heavy and light industries	6 hospitals Sanatorium Clinics Hotels Barracks Schools	4 power plants (total 26,781 kw.) Gas works Water system In telephone-telegraph network Post and telegraph offices Radio-telegraph station 3 broadcasting stations 4 other radio stations	Oblast capital
155	Minsk 53°54′N, 27°34′E Pop. 240,000 (1941) 150,000 (1946 est.)	On the Svisloch' river near the former USSR – Poland border Minskaya Oblast' Capital of White Russian SSR	Rail: Lines to Vil'nyus, Moscow, Bobruysk, and Brest Road: Hwys to Logoysk, Borisov, Mogilev, Slutsk, Radoshkovichi, and Vil'nyus Air: 2 airfields; 3 landing fields nearby	Important trade city, industrial and farm products Varied heavy and light industries	Hospitals Hotels Barracks	1 power plant restored (15,000 kw.) Water system Post and telegraph office In telephone-telegrpah network Radio broadcasting station	Oblast capital
240	Nikolayev (Vernoleninsk, Nikolaev) 46°58′N, 32°00′E Pop. 167,100 (1939)	On the Yuzhnyy (Southern) Bug river Nikolayevskaya Oblast', Ukrainian SSR	Rail: Lines to Znamenka, Dnepropetrovsk, Kherson, and Oktyabr'skoye (formerly Bogoyavlensk) Road: Hwys to Kirovograd, Khar'kov, Kherson, and Odessa Air: 2 seaplane bases; 4 landing fields Water: Seaport	Varied heavy and light industries	Hospital Barracks	2 power plants (total 37,000 kw.) In telephone-telegraph network 5 radio stations	Oblast capital
238	Odessa 46°28′N, 30°45′E Pop. 604,200 (1939) 604,000 (1941 est.)	On Black Sea coast Odesskaya Oblast', Ukrainian SSR	Rail: Lines to Ovidiopol', Kotovsk, and Pomoshnaya Road: Hwys to Ovidiopol', Nikolayev, and Yasski (all at least partly dirt roads) Air: 4 airfields; 2 seaplane bases; 3 landing fields Water: Important seaport	Varied heavy and light industries	Several hospitals Hotels Barracks Military schools	3 power plants Water system Post and telegraph offices In telephone-telegraph network 14 radio stations	Oblast capital
145	Orēl 52°58′N, 36°05′E Pop. 110,600 (1939)	At confluence of the Orlik and Oka rivers Orlovskaya Oblast', RSFSR	Rail: Lines to Tula, Yelets, Kursk, Bryansk, and Verkhov'ye Road: Hwys to Bolkhov, Tula, Novosil', Maloarkhangel'sk, Livny, Kursk, and Bryansk Air: 7 airfields	Varied heavy and light industries	3 hospitals 3 hotels Military schools	1 power plant Post, telephone, and telegraph offices Radio station for commercial airfield and one other	Oblast capital

86	Rīga 56°57′N, 24°05′E Pop. 385,000 (1935) 480,000 (1946 est.) Rīgas Jūrmala: Pop. 7,860 (1935)	15 km. above mouth of the Daugava (Zapadnaya Dvina), on both sides of the river (800 m. wide) The Lielupe empties into the Daugava just below Rīga; the Gauja empties into Gulf of Riga (Rīgas Jūras Līcis) farther east Series of islands in the river at Rīga City area 211 sq. km. (36 sq. km. of it water) 175 sq. km. land Rīgas Jūrmala (Rīga Beach) is 17 km. west of Rīga, between Gulf of Riga and the Lielupe Latvia	Rail: Lines to Ventspils, Daugavgrīva, Puikule, Sigulda, Daugavpils, and Jelgava Road: Hwys to Ape, Daugavpils, Baldone, Bauska, Jelgava, and Kalnciems Air: Airfield. Seaplane base on Ķīšezers (lake). Minor airfields in Bolderāja and two other places Water: River frozen Dec.-Feb., but ice breakers maintain traffic Internal: Old city on right bank has narrow, crooked streets. New city is on right bank. Trolley cars being replaced by trolley busses	Varied heavy and light industries	8 hospitals 12 large hotels 20 universities, colleges and high schools 20,000 summer cottages at Rīgas Jūrmala 11 barracks, large camp at Ķīšezers	2 gas works 6 power plants Several water towers Post, telegraph and telephone offices Broadcasting station 3 other radio stations	.....
256	Rostov-na-Donu (Rostov-on-Don) 47°13′N, 39°42′E Pop. 510,300 (1939)	On both banks of the Don about 40 km. (25 miles) above its mouth in Sea of Azov (Azovskoye More) Rostovskaya Oblast', RSFSR	Rail: Lines to Novocherkassk, Bataysk, and Taganrog Road: Hwys to Novocherkassk, Bataysk, and Taganrog Air: 4 airfields Water: Sea and river ports; harbor ice-bound 107 days per year	Varied large-scale industries including manufacture of aircraft and agricultural machinery	Hotels Barracks Military schools	Power plant (10,000-25,000 kw.; coal-burning) 6 industrial power plants Post office Radio telegraph station Broadcasting station 10 other radio stations	Oblast capital Considerable war damage
246	Sevastopol' (Akhiar) 44°36′N, 33°31′E Pop. 111,900 (1939) 112,000 (1941 est.)	On high ground on W side of the Yuzhnaya Bukhta (Southern Inlet) of the Black Sea Krymskaya Oblast', RSFSR	Rail: 2 lines to Simferopol' Road: Hwys to Simferopol' and Mekenziyevy Gory; military coast road running N and S from the city Water: Ice-free harbor with anchorage for large steamers Air: 2 airfields; 2 others in area; 2 naval air bases with seaplane moorings	Shipyards	Naval barracks	2 power stations 4 water works In telephone-telegraph network Radio telegraph station 3 coastal and 2 other radio stations	Important naval base
245	Simferopol' 44°58′N, 34°03′E Pop. 142,700 (1939)	In the northern foothills of the Khrebet Yayla, the second range of the Krymskiye Gory, and on both banks of the Salgir river Krymskaya Oblast', RSFSR	Rail: Lines to Melitopol' and Sevastopol' Road: Hwys to Feodosiya, Yalta, Sevastopol', and Perekop Air: Landing field	Mostly light and engineering industries	Hotels University Various public buildings	Power plant (500 kw.) Post office In telephone-telegraph network Radio telegraph station Broadcasting station	Oblast capital
103	Smolensk 54°48′N, 32°03′E Pop. 156,700 (1939) 156,000 (1941 est.)	On both banks of the Dnepr, 85 m. (279ft.) above river Smolenskaya Oblast', RSFSR	Rail: Lines to Sukhinichi, Bryansk, Vyaz'ma, Orsha, and Vitebsk Road: Hwys to Vyaz'ma, Roslavl', Orsha, Vitebsk, Demidov, and Dukhovshchina Air: 2 airfields	Varied heavy and light industries	2 hotels Barracks University Aviation and military school Public buildings	Power plant (destroyed during war) Post, telegraph, and telephone office 2 radio stations Broadcasting station	Oblast capital Cathedral
197	Stalingrad (formerly Tsaritsyn) 48°40′N, 44°30′E Pop. 445,500 (1939) over 300,000 (Jan. 1947) 600,000 (planned)	On bluffs of right bank of the Volga Stalingradskaya Oblast', RSFSR	Rail: Lines to Likhaya, Sarepta, Povorino, and the Donets Basin Road: Hwys to Krasnoarmeyskoye and Kachalino Air: 8 airfields Water: Steamer landings	Varied large-scale industry	Hospitals Hotels Schools (including aviation and military schools) Public buildings	4 power plants (total 254,000 kw.), coal-burning Water system Post and telegraph office Broadcasting station 3 other radio stations	Oblast capital

TABLE I – 7 (Continued)

Figure I–13 Index No.	Name, coordinates, population	Geographical characteristics	Means of access and internal transportation	Resources and trade	Health, hospitals, and billeting	Utilities and telecommunications	Remarks
252	Stalino (Yuzovka, Yuzovo, Hughesovka) 47°58′N, 37°48′E Pop. 462,400 (1939) 462,000 (1941 est.)	On the unnavigable Kal'mius river and in western part of Donets Basin Stalinskaya Oblast', Ukrainian SSR	Rail: Lines to Taganrog, Kramatorsk, Khar'kov, and Mariupol' Road: Hwys to Taganrog, Khar'kov, Dnepropetrovsk, Kiev, and Zaporozh'ye Air: Airfield	Varied large-scale industries; coal and iron-ore mining	.....	Power plant (22,000 kw.) Water system Sewerage system In telephone-telegraph network Broadcasting station 2 radio-telegraph stations	Oblast capital
117	Stalinogorsk (Bobriki) 54°05′N, 38°13′E Pop. 76,200 (1939)	E of Tula; on right bank of Don Moskovskaya Oblast', RSFSR	Rail: Near Uzlovaya-Ozherel'ye Line Road: A few poor roads Air: Airfield. 2 landing fields	Chemical industry Machinery plant Coal mining	.....	Steam power plant (350,000 kw.; lines to Moscow) Water system Sewerage system Telephone and telegraph connections Radio station for airfield and one other	.....
226	Stanislav (Stanislawów, Stanislau, Stanislavyv) 48°56′N, 24°44′E Pop. 60,000 (Dec. 1940)	Bounded by 3 rivers Stanislavskaya Oblast', Ukrainian SSR	Rail: Lines to L'vov and Kolomyya Road: Hwys to Buchach, Dolina, and Nadvornaya Air: Airfield	Varied industries (including oil refineries)	3 hospitals Barracks Prison 38 schools Public buildings	3 power plants (total 1,932 kw.) Gas works Post, telephone, and telegraph offices Broadcasting station Radio station	5,913 dwellings in 1931 Oblast capital
254	Taganrog 47°13′N, 38°55′E Pop. 188,800 (1939) 190,000 (1941 est.)	On N shore of Taganrogskiy Zaliv (Taganrog Gulf), part of Sea of Azov (Avozskoye More) Rostovskaya Oblast', RSFSR	Rail: Lines to Ilovayskoye, Rostov-na-Donu, and Pokrovskiy Road: Hwys to Pokrovskiy, Mariupol', and Rostov-na-Donu Air: 3 airfields; landing field and auxiliary seaplane base Water: Harbor with 3 basins; port ice-bound from mid-Dec. to mid-March.	Varied large-scale industries	Hospital Hotels Barracks Aviation technical school	Power plant (10,000-25,000 kw.; coal-burning) 3 industrial power plants Gas works Water system Post office 4 radio stations including coastal and radio-telegraph stations	Lighthouse
27	Tallinn (Reval) 59°27′N, 24°45′E Pop. 146,000 (1939) 150,000 (1946 est.) Said to be consolidated with Nõmme, pop. 15,110 (1934) (Nõmme entirely residential)	On a terrace on steep coast along Gulf of Tallinn (Tallinna Laht), Gulf of Finland Lower city on beach shelf; upper city 80 m. (262 ft.) higher, on limestone plateau Estonia	Rail: Lines to Tapa, Rapla, and Paldiski Road: Hwys to Narva, Tartu, Viljandi, Rapla, Haapsalu, Pärnu, and Keila Air: 2 seaplane bases; 2 airfields Water: Port of import and export. (See remarks)	Varied heavy and light industries	5 hospitals 2 clinics 23 upper schools 4 hotels Barracks	Power plant (20,000 kw.) Gas works Water system Water tower 3 post and telegraph offices Radio broadcasting station and 3 other radio transmitters	Capital of Estonia Tallinn: 8,627 dwellings, 6,680 of wood Nõmme: 2,466 dwellings, 2,369 of wood. 4 R.R. stations, 2 of them narrow-gage, in Tallinn. Nõmme is a station on the Tallinn-Keila line Harbor consists of New, Old, and Fishing Harbors, aggregating 60 hectares, length of quays over 6 km., all with track connections. 4 floating cranes, 4 floating docks. Depths 5.5 to 10 m. Old walled center of city has narrow, crooked streets; newer districts broad and regular

92	Vil'nyus (Wilno, Vilna, Vilnius) 54°41′N, 25°16′E Pop. 209,500 (1939) 250,000 (1946 est.)	Confluence of the Vileyka and the Neris Lithuania	Rail: Lines to Daugavpils, Molodechno, Lida, Grodno, and Kaunas Road: Hwys to Pobrade, Oshmyany (Oszmiana), Eyshishki, and Meyshagola Air: Porubank airfield (military and civilian)	Varied heavy and light industries	6 hospitals, 1 eye clinic Barracks	Gas works Power plant (4,800 kw.); 2 other small power plants supplied 500 and 6,300 v. Water-pumping plant, water tower, water-pumping station Sewer and drainage system Post and telegraph offices Automatic telephone system Broadcasting transmitter	12,083 dwellings in 1931 Capital of Lithuania Old city in center, surrounded by remains of wall; new city outside, with straight, broad streets
201	Voroshilovgrad (formerly Lugansk) 48°35′N, 39°18′E Pop. 213,000 (1939)	At confluence of the Ol'khovaya and Lugan' rivers, 16 km. (10 miles) from the Severnyy Donets river Voroshilovgradskaya Oblast', Ukrainian SSR	Rail: In Severnyy Donets Basin R.R. network Road: Hwy to Voroshilovsk Air: 6 airfields	Varied heavy and light industries	Hotels Barracks Public buildings	Power plant (25,000 kw.) Post office In telephone-telegraph network Radio telegraph station 3 radio stations	Oblast capital
24	Vyborg (Viipuri, Viborg) 60°43′N, 28°47′E Pop. 30,000 (1941)	Located on a peninsula and an island in Vyborgskiy Zaliv, a bay extending NE from the eastern part of the Gulf of Finland Leningradskaya Oblast', RSFSR	Rail: Lines to Antrea, Leningrad, and Helsinki. Road: Hwys to Kheyn'yoki (Heinjoki), Leningrad, Terioki, Koyvisto (Björkö), and Helsinki Air: Auxiliary seaplane base Water: Ocean shipping. South and north harbors, divided by the Abo bridge. Uuras outer harbor is for the largest ships	Important trade city, linked with the Finnish interior, the Baltic states, and USSR Lumber exports especially spur track to lumber harbor, 12 km. SW Many sawmills Vyborg once had 90 factories: sawmills, shipyard, machine-building shops, cereal mills	.....	In telephone-telegraph network Broadcasting station Commercial airfield radio station	Rayon center City was almost completely destroyed in the Finnish-Russian war. No data on industrial reconstruction
250	Zaporozh'ye (formerly Aleksandrovsk) 47°48′N, 35°11′E Pop. 289,200 (1939) 290,000 (1941)	On the left bank of the Dnepr Zaporozhskaya Oblast', Ukrainian SSR	Rail: Lines to Dnepropetrovsk, Stalino, Melitopol', and Nikopol' Road: Hwy connections with Mariupol', Melitopol', and Dnepropetrovsk Air: 5 airfields Water: Military port	Electric steel furnaces Varied heavy and light industries	Barracks	Prewar hydroelectric development on Dnepr (558,000 kw.) New Zaporozhstal' plant (25,000 kw.) In telephone-telegraph network 2 radiotelegraph stations	Oblast capital

C. Unoccupied area

(1) Introduction

The unoccupied area of European USSR (excluding the Caucasus, JANIS 41 area) comprises six ASSR's of the RSFSR. Moscow and Leningrad, the two USSR cities of over 1,000,000 population, were near the front lines and suffered extensive damage. Other cities were bombed by air, but damage was not comparable to that in the occupied area. The cities of this area received little of the equipment evacuated from the east. Because of the uncertainties as to the extent of German advance, equipment and personnel were moved to the Urals or beyond. However, considerable industrial development had occurred in this area before the war. Gor'kiy *58*, Saratov *192*, Engel's *193*, and Kuybyshev *130* are surrounded by major industrial plants. Because war damage was limited, the prewar information provides a much more up-to-date picture of the unoccupied area and fewer changes are to be expected.

Although the unoccupied area is, as a whole, the less densely populated, a limited area around Moscow east of the line of occupation has the greatest density of population in the USSR.

With the exception of Kronshtadt *32* (in the Gulf of Finland) all the major cities of the unoccupied area are located on major rivers and are important river ports. Eight are located on the Volga river.

The smaller towns and villages conform to the general types previously described, particularly types e) to i) (Topic 8, A, (5)).

Most of the population is distributed through the valleys of the Volga river and tributaries, and the Don river. In the north, the population is mostly limited to the few towns.

(2) Major cities and towns

(TABLE I-8)

There were 23 urban areas with prewar populations of about 20,000 and over.

Moscow *107* is the capital of both the USSR and the RSFSR, as well as the administrative center of ten major cities. It has a central location and is the hub of the USSR's railroad and highway systems. Recent improvements on the Moskva river and the Kanal Imeni Moskvy (Moscow - Volga Canal) have made the city a major river port. Moscow is one of the major industrial centers, comparable with Leningrad. A shift toward heavier industries has occurred since the war. Public utilities are generally well developed. Although the city was bombed, it did not suffer damage comparable to that in Leningrad.

Leningrad *37* was the most important industrial city of the Empire prior to World War I. Although much of the subsequent industrial construction has been allocated to Moscow, the Urals, or other locations, Leningrad is still a major industrial center. It is served by rail lines radiating in all directions and by a number of main highways. It is a major port on the Baltic Sea and on the inland waterway system. Although the city was subject to shelling from both Finnish and German lines, a number of its important industries remained in operation. Much industrial capacity has since been restored, and residential structures are being rebuilt on improved plans.

Among the more important river and seaports are Arkhangel'sk *9*, Astrakhan' *259*, Shcherbakov *46*, Murmansk *3*, Kolomna *113*, and Molotovsk *10*. Kronshtadt *32*, formerly an important commercial port, is now exclusively a naval base.

Penza *136*, Kirov *52*, Tambov *138*, and Vologda *47* are junction points of railroads and highways and are of importance primarily as centers of commerce, although they have some industrial production.

Most cities have some factories and a number have some heavy industries. Cities of primarily industrial importance include Gor'kiy *58*, Kazan' *127*, Kuybyshev *130*, Saratov *192* and Engel's *193*, Yaroslavl' *70*, Tula *110*, Kostroma *63*, Noginsk *115*, Kolomna *113*, and Lipetsk *141*. For the most part, the facilities of these cities survived the war.

TABLE I – 8

MAJOR URBAN AREAS IN UNOCCUPIED AREA

(This table lists only the known data. Many towns may have other facilities not listed herein.)

Figure I – 13 Index No.	Name, coordinates, population	Geographical characteristics	Means of access and internal transportation	Resources and trade	Health, hospitals, and billeting	Utilities and telecommunications	Remarks
9	Arkhangel'sk (Archangel) 64°33′N, 40°32′E Pop. 280,000 (1941)	Elevation: 9 m. On right bank of Severnaya Dvina, 45 km. (28 miles) above its mouth in the White Sea (Beloye More). R.R. station is on left bank (Arkhangel'sk-Pristan') Arkhangel'skaya Oblast', RSFSR	Rail: Connections via Vologda with Leningrad and Moscow. Connections via Kotlas and Kirov with Trans-Siberian R.R. Road: Road to Kholmogory Air: 8 airfields, 2 with seaplane landings Water: Ocean shipping; steamship connection with Vardø (Norway) and White Sea ports; channel open to navigation 5 months per year	Varied heavy and light industries; important shipyards	Military hospital Hotels Barracks	Power plant Post and telegraph office Radio broadcasting station Naval post with radio station 8 other radio stations	Oblast capital
259	Astrakhan' 46°22′N, 48°05′E Pop. 253,600 (1939)	On Dolgiy Ostrov, an island in the Volga 90 km. (55 miles) above its estuary in the Caspian Sea Astrakhanskaya Oblast', RSFSR	Rail: Connections with Buzan Road: Highway to Stalingrad Air: 4 airfields, 1 with seaplane landing Water: Harbor icebound 3 months per year. 48 wharves with cranes and facilities	Extensive shipyards Important fisheries Varied heavy and light industries	3 hospitals Hotels Barracks Public buildings	2 power plants Waterworks Telephone-telegraph service Broadcasting station 6 coastal radio stations	Oblast capital Important river port and harbor
193	Engel's (formerly Pokrovsk) 51°30′N, 46°05′E Pop. 73,300 (1939)	On left bank of the Volga opposite Saratov Saratovskaya Oblast', RSFSR	Rail: Line to Anisovka Road: Highways to Marks, Novouzensk, Gnadentau, and Rovnoye (Zel'man) Air: Airfield Water: River port	Varied heavy and light industries	Schools (including aviation school)	Power plant Pumping station Broadcasting station	.....
58	Gor'kiy (Gorki, Gorky; (formerly Nizhniy Novgorod) 56°20′N, 44°00′E Pop. 650,000 (1941) 900,000 (1946)	At confluence of the Oka and Volga rivers Gor'kovskaya Oblast', RSFSR	Rail: Lines to Moscow, Kirov, Metallist (Pavlovo), and Arzamas Road: Highways to Semënov, Cheboksary, Arzamas, Gorokhovets, and Balakhna Air: 7 airfields Water: River port	Varied heavy and light industries; center of automobile production	Hotels Barracks Military school University Public buildings	3 power plants Natural gas plant Post offices Telephone-telegraph service Broadcasting station 5 radio stations	Oblast capital
127	Kazan' (Kasan) 55°47′N, 49°08′E Pop. 401,700 (1939) 650,000 (1946)	On left bank of the Volga near mouth of Kazanka river Tatarskaya ASSR, RSFSR	Rail: Lines to Agryz and Yudino Road: On Moscow – Sverdlovsk highway; connections with Arsk and Gor'kiy Air: 5 airfields Water: River port	Varied heavy and light industries	2 hospitals 2 university clinics Barracks University Schools Prison Public buildings	2 power plants Gas works Water system Post office Telegraph office Broadcasting station 4 radio stations	Oblast capital
52	Kirov (formerly Vyatka) 58°36′N, 49°41′E Pop. 143,200 (1939)	On the high left bank of the Vyatka river Kirovskaya Oblast', RSFSR	Rail: Connections with Kotel'nich and Kotlas Road: Highways to Glazov, Molotovsk (formerly Nolinsk) and Khalturin Air: Airfield	Varied heavy and light industries	Hospital Hotels	Power plant (61,000 kw.) Water supply system Telephone-telegraph service 5 radio stations	Oblast capital

TABLE I – 8 (Continued)

FIGURE I – 13 Index No.	Name, coordinates, population	Geographical characteristics	Means of access and internal transportation	Resources and trade	Health, hospitals, and billeting	Utilities and telecommunications	Remarks
113	Kolomna 55°05′N, 38°47′E Pop. 75,100 (1939)	On the right bank of the Moscow river at its confluence with the Oka Moskovskaya Oblast', RSFSR	Rail: Lines to Moscow, Ryazan', and Ozery Road: Highways to Moscow and Ryazan' Air: Airfield Water: River port	Varied heavy and light industries	.....	Power plant (1,000-3,000 kw.; coal-burning) Water system Telephone and telegraph connections	.....
63	Kostroma 57°46′N, 40°57′E Pop. 121,200 (1939)	On the high, steep left bank of the Volga at the mouth of the Kostroma river Kostromskaya Oblast', RSFSR	Rail: Line to Nerekhta Road: Highways to Nerekhta, Galich, Kineshma, and Yaroslavl' Water: River port Air: 3 landing fields	Varied industries	Hotel Public buildings	Power plant (10,000-25,000 kw.; peat-burning) Post, telephone, and telegraph offices	.....
32	Kronshtadt (Kronstadt) 59°59′N, 29°47′E Pop. 60,000 (1939)	On the E side of Ostrov Kotlin in the Gulf of Finland 49 km. (30 miles) W of Leningrad Leningradskaya Oblast', RSFSR	Rail: Railway serving island and outlying forts Road: No roads to mainland. Air: Airfield and seaplane landing Water: Important naval base with elaborate installations	Munitions plants Shipyards	Hospital Barracks Military and naval schools 2 prisons	Power plant Gas works Pumping station Telegraph station Coastal radio station	Town completely barred to civilian commerce Gridiron street pattern
130	Kuybyshev (Kuibyshev; (formerly Samara)) 53°12′N, 50°09′E Pop. 390,000 (1939) 600,000 (1946)	On hills between the Volga and Samara rivers Kuybyshevskaya Oblast', RSFSR	Rail: Lines to Kinel', Saratov, and Syzran' Road: Highway to Krasnyy Yar Air: 4 airfields Water: River port	Varied heavy and light industries	Hospitals Hotels Advanced schools	Hydroelectric power plant (27,000 kw.) Telephone-telegraph service Post and telegraph office 6 radio stations Broadcasting station	Oblast capital
87	Leningrad (Petrograd, St. Petersburg) 59°57′N, 30°20′E Pop. 3,191,300 (1939) 2,800,000 (1946)	In the Neva estuary at the eastern end of the Gulf of Finland Leningradskaya Oblast', RSFSR	Rail: Lines to Oraniyenbaum, Gatchina, Luga, Vitebsk, Novgorod, Moscow, Murmansk, Keksgol'm, Vyborg, and Sestroretsk Road: Roads to Petrodvorets, Novgorod, Moscow, the Karelian Isthmus, and the Baltic States Air: 4 airfields, 2 seaplane bases. Water: Important seaport	Varied large-scale industries	Hospitals Billeting	Water supply Power plants Center of telephone-telegraph network 35 radio stations 2 broadcasting stations	Oblast capital
141	Lipetsk 52°36′N, 39°35′E Pop. 66,600 (1939)	On the high right bank of the Voronezh river Voronezhskaya Oblast', RSFSR	Rail: Lines to Gryazi and Yelets Road: Highways to Ranenburg, Voronezh, and Lebedyan' Air: 4 airfields. Seaplane base	Heavy industry	3 hospitals Aviation school	Power plant (24,000 kw.) Telephone and telegraph connections Radio telegraph office	.....
10	Molotovsk 64°34′N, 39°50′E (approx.) Pop. 15,000–20,000 (1944 est.) 10,000 (1945 est.)	W of Arkhangel'sk; on SW coast of Dvinskaya Bukhta (Gulf) of White Sea (Beloye More). Generally ice-free harbor Arkhangel'skaya Oblast', RSFSR	Rail: Line to Arkhangel'sk Road: 5 km. road between port and city Air: Airfield. Seaplane landing Water: Seaport	New shipyard Metal industries	2 hospitals	Power plant Sewerage system Radio station	.....

107	Moscow (Moskva) 55°45′N, 37°37′E Pop. 4,342,000 (1941) 4,500,000 (1946)	On Moscow river Moskovskaya Oblast', RSFSR	Rail: Lines to Vyaz'ma, Yaroslavl', Rzhev, Bologoye, Leningrad, Ryazan', Vladimir, Tula, and Yelets Road: Highways to Serpukhov, Noginsk, Gor'kiy, Dmitrov, and Kiev Air: 22 airfields	Varied heavy and light industries	166 hospitals	Center of a large electric power grid Water system 70 radio stations (10 international) 7 broadcasting stations	Capital of entire USSR
3	Murmansk 68°58′N, 33°05′E Pop. 117,000 (1939) 95,000 (1946)	On the east side of inner Kol'skiy Zaliv Murmanskaya Oblast', RSFSR	Rail: Terminus of the Murmansk R.R. (from Leningrad) Air: 15 airfields and 2 seaplane landings Water: The only ice-free, sheltered harbor of northern USSR, accessible to the largest ships	Varied heavy and light industries	3 hospitals Hotel Naval technical school Barracks	Steam power plant (8,000 hp.) Main current supply is from the Nizhnyaya Tuloma (Lower Tuloma) hydraulic plant (50,000 kw.), 30 km. SW 6 radio stations	Oblast capital
115	Noginsk 55°51′N, 38°26′E Pop. 81,000 (1939)	On both banks of the Klyaz'ma river Moskovskaya Oblast', RSFSR	Rail: Branch line connects with Moscow – Gor'kiy Line Road: Highways to Moscow, Vladimir, and Zagorsk Air: 2 airfields	Varied heavy and light industries	.....	Broadcasting transmitter Power plant Sewerage system Telephone and telegraph connections Radio station	.....
136	Penza 53°12′N, 45°01′E Pop. 157,100 (1939)	On left bank of the Sura river Penzenskaya Oblast', RSFSR	Rail: Lines to Rtishchevo, Kuznetsk, Lunino, and Morshansk Road: Highways to Gorodishche, Petrovsk, Mokshan, and Lunino Air: Airfield	Varied heavy and light industries	2 hotels Schools	Power plant Post, telephone, and telegraph offices Radio station Broadcasting station	Oblast capital
192	Saratov 51°32′N, 46°00′E Pop. 375,900 (1939)	On right bank of Volga Saratovskaya Oblast', RSFSR	Rail: Lines to Moscow, Kamyshin, Syzran', and Urbakh Road: Highways to Penza and Stalingrad Air: 3 airfields Water: River port	Varied large-scale industries	Hotels Barracks Schools (including university)	Power plant (with long distance lines) Post office Telephone and telegraph service Radio telegraph station Broadcasting station	Oblast capital
46	Shcherbakov (formerly Rybinsk) 58°03′N, 38°51′E Pop. 139,000 (1939)	On right bank of upper Volga Yaroslavskaya Oblast', RSFSR	Rail: Lines to Yaroslavl' and Sonkovo Road: Highways to Yaroslavl', Uglich, and Vologda Air: 4 airfields Water: River port	Varied large-scale industries including shipyards, armaments plants, and huge underground aircraft and locomotive factory	Hotel Barracks	Hydroelectric development on Volga (330,000 kw.) Post and telegraph office Telephone office Radio station	Gridiron street pattern
138	Tambov 52°45′N, 41°23′E Pop. 121,300 (1939)	On the Tsna river Tambovskaya Oblast', RSFSR	Rail: On Mocsow – Ryazan' – Saratov and Tambov – Balashov Lines Air: 2 airfields	Varied large-scale industries	4 hospitals Hotel Civil aviation school Cavalry school Public buildings	Power plant Telephone and telegraph connections Airfield radio station	Oblast capital
110	Tula 54°12′N, 37°37′E Pop. 272,400 (1939)	On both banks of the unnavigable Upa river near the mouth of the Tilitsa river Tul'skaya Oblast' RSFSR	Rail: Lines to Uzlovaya, Serpukhov, Kaluga, and Orël Road: Highways to Serpukhov, Venev, Mikhaylov, Bogoroditsk, Orël, Kaluga, Odoyevo, and Aleksin Air: 2 airfields	Varied large-scale industries	Hotel Aviation school Military quarters Public buildings	Power plant (20,000-50,000 kw.) Water system Sewerage system Gas works Post, telephone, and telegraph offices Radio station for commercial airfields and two others	Oblast capital

TABLE I - 8 (Continued)

Figure I - 13 Index No.	Name, coordinates, population	Geographical characteristics	Means of access and internal transportation	Resources and trade	Health, hospitals, and billeting	Utilities and telecommunications	Remarks
47	Vologda (Wologda) 59°14'N, 39°50'E Pop. 95,200 (1939)	On Vologda river, tributary of the Sukhona Vologodskaya Oblast', RSFSR	Rail: Lines to Moscow, Kirov, Arkhangel'sk, and Leningrad Road: Highways to Gryazovets, Kadnikov, Cheropovets, and Shcherbakov Air: 3 military airfields Water: River port, steamer connection with the Severnaya Dvina and the Volga	Varied heavy and light industries	Hotels	2 power plants (old and new) Post and telegraph office Radio station	Oblast capital Kreml, bishop's castle, 3 cathedrals, museum, botanical gardens Dairy institute
70	Yaroslavl' 57°37'N, 39°53'E Pop. 300,000 (1946)	On both banks of the Volga (mostly on steep right bank) at the mouth of the Kotorosl' river Yaroslavskaya Oblast', RSFSR	Rail: Lines to Vologda, Moscow, Shcherbakov, and Ivanovo Road: Highways to Danilov, Zagorsk, Shcherbakov, and Vladimir Air: Airfield. 3 others in vicinity Water: River port	Varied heavy and light industries	Hospitals 3 hotels Schools Public buildings	2 large power plants (49,000 and 36,000 kw.; both peat-burning) Water system Post, telephone, and telegraph offices	Oblast capital

9. RESOURCES AND TRADE

European USSR is a key sector in the Soviet economy of collective ownership and state control, with its announced basic objective of increasing the military-economic potential sufficiently to secure the USSR against "any contingencies".

The area contains about two-thirds of total Soviet population, including the bulk of labor skilled by Soviet standards. Except for deficiency in petroleum production, European USSR is a relatively self-sufficient economic area. The area normally produces a food surplus, is a major center of armament and other finished manufacture, has more than 70% of USSR installed electric generating capacity and, despite industrial dispersion eastward and World War II destruction, by 1950 is planned to again produce from area ore and coal at least one-half of total Soviet iron and steel.

A. Agriculture

Despite considerable industrialization, agriculture is the chief factor in the economy of European USSR, employing more than half of its population and over one-fifth of its area. There are considerable regional differences with respect to food supply: the country is broadly divided into a grain deficit area, corresponding roughly to the zone of nonblack soils, and a grain surplus area, broadly including the black-soil area. European USSR as a whole is normally self-sufficient in most foodstuffs and, before World War II, exported small quantities of wheat, rye, barley, oats, oilseeds, and sugar.

(1) Natural environment

The soils of European USSR, though diversified, fall into twto well-defined geographic areas. The nonblack-soil belt, composed of infertile, leached podsol, extends over the northern and north central parts of the country and accounts for 71% of its area. The black-soil belt, consisting of chernozem, fertile and rich in humus, extends over the steppe of the central agricultural, middle and lower Volga and the southern regions, and accounts for 26% of the area of European USSR (FIGURE I-14).

In the northern and north central regions, low temperatures and periods of excessive moisture hamper agriculture. In the south, particularly the southeast, moisture deficiency hinders production. The growing season is relatively short, curtailing the period of field work, and limiting the varieties of crops.

(2) Land tenure and farm system

Agricultural collectivization in the 1930's developed three types of farm units. The collective farms or *kolkhozy* represent the pooling of the holdings of formerly independent farmers operating under tight government control, and accounted for 86% of the crop area in 1938 (TABLE I-9). The state farms or *sovkozy* are entirely owned and operated by the state; their share of the crop area amounted to less than 8% in the same year. State machine-tractor stations supply power machinery and operators to the *kolkhozy* on the basis of annual agreements for payment in kind at specified rates per hectare (2.471 acres).

(3) Farm practices

While acreage was being increased under collectivization, the yield per acre declined, due to inferior land brought under cultivation and inefficiency of management and labor. The government's remedial program includes crop rotation, conservation of soil moisture, control of

INDEX OF TOWNS

MAJOR CITIES AND TOWNS ARE INDICATED BY ITALICIZED NUMBERS IN THE TEXT, AND BY UNDERSCORED NUMBERS ON FIGURE I-13; MINOR TOWNS BY PARENTHESES

* See Leningradskaya Oblast' large scale insert (FIGURE I-13).

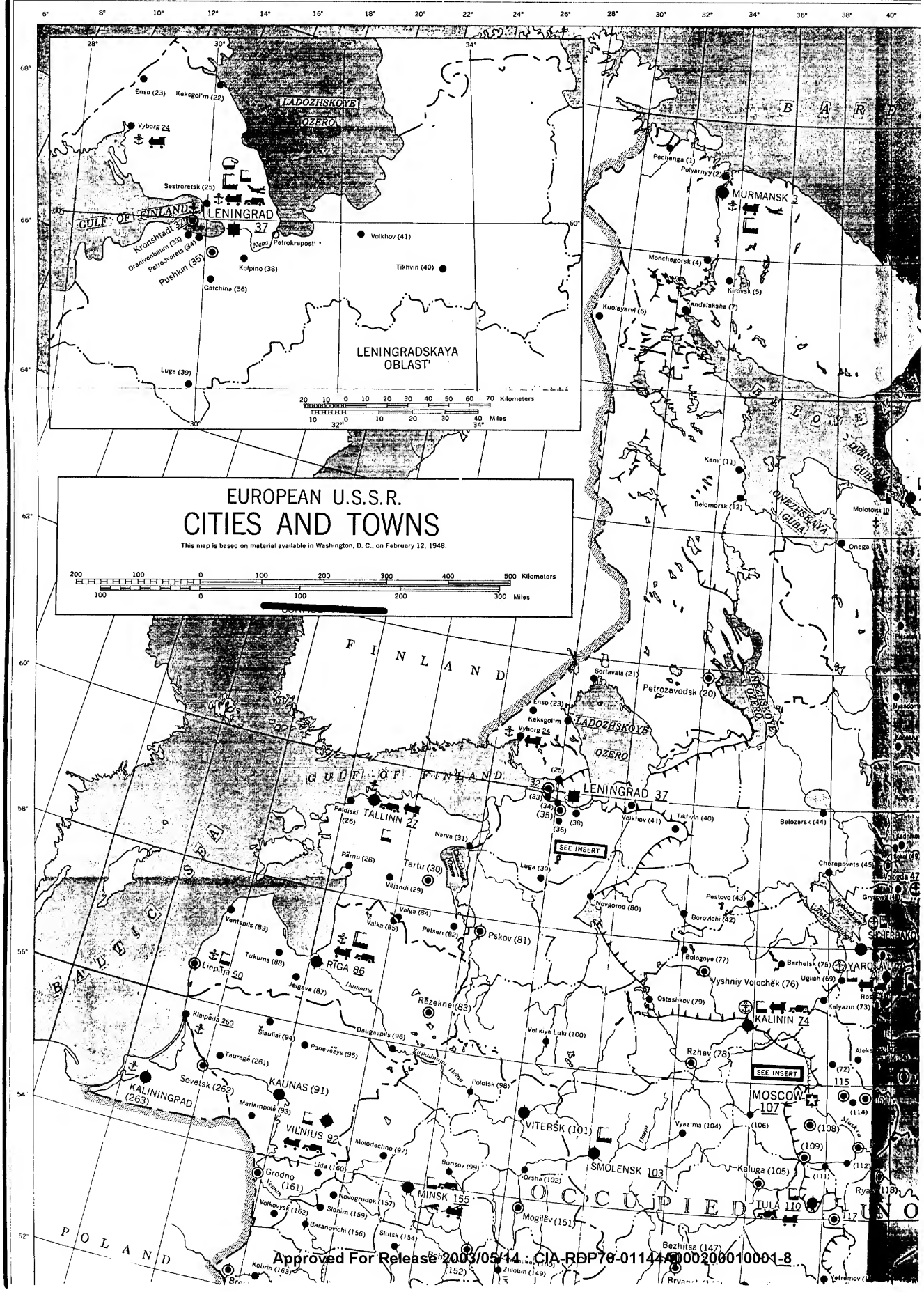

FIGURE I-13
CITIES AND TOWNS, EUROPEAN USSR
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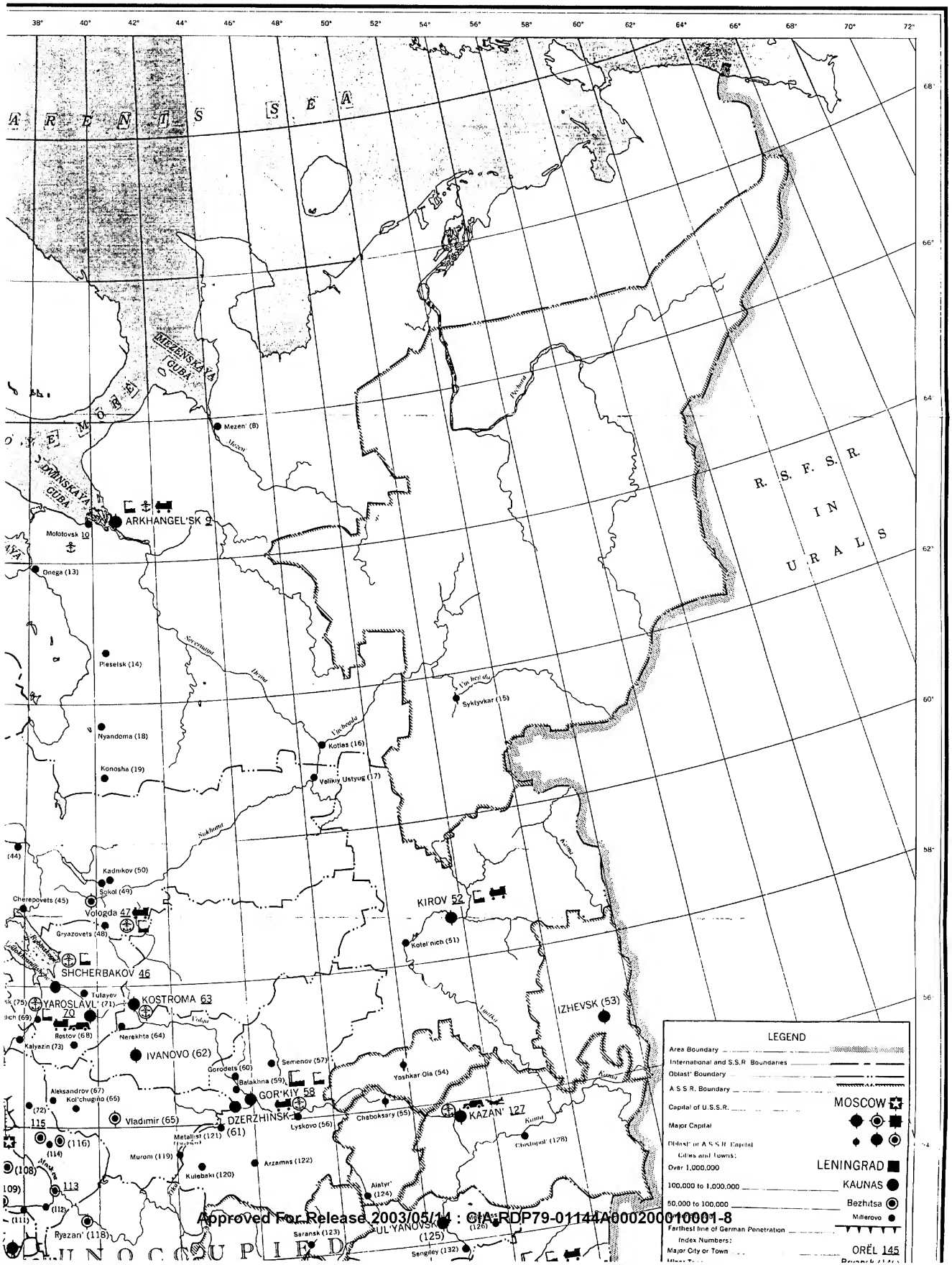

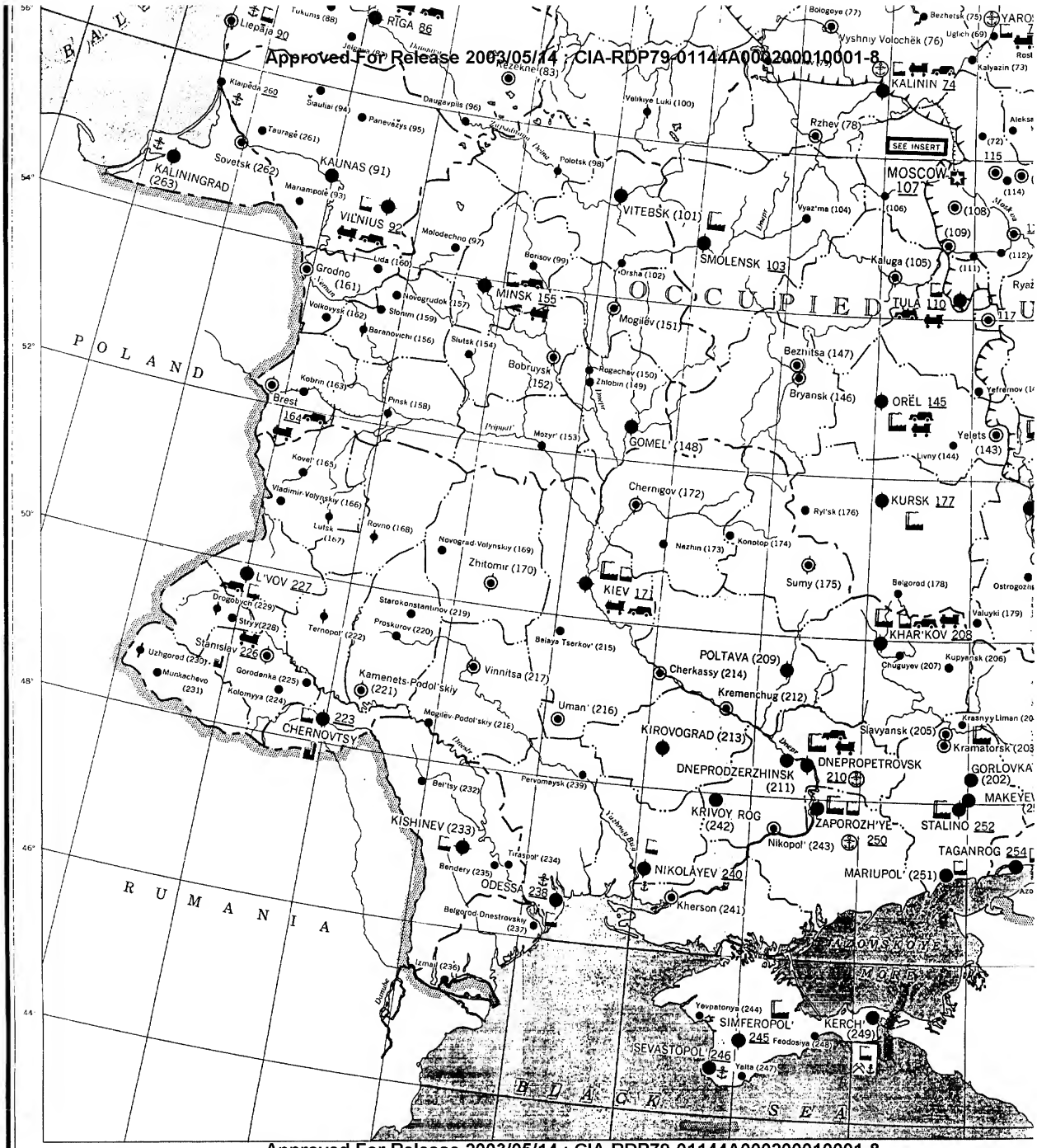

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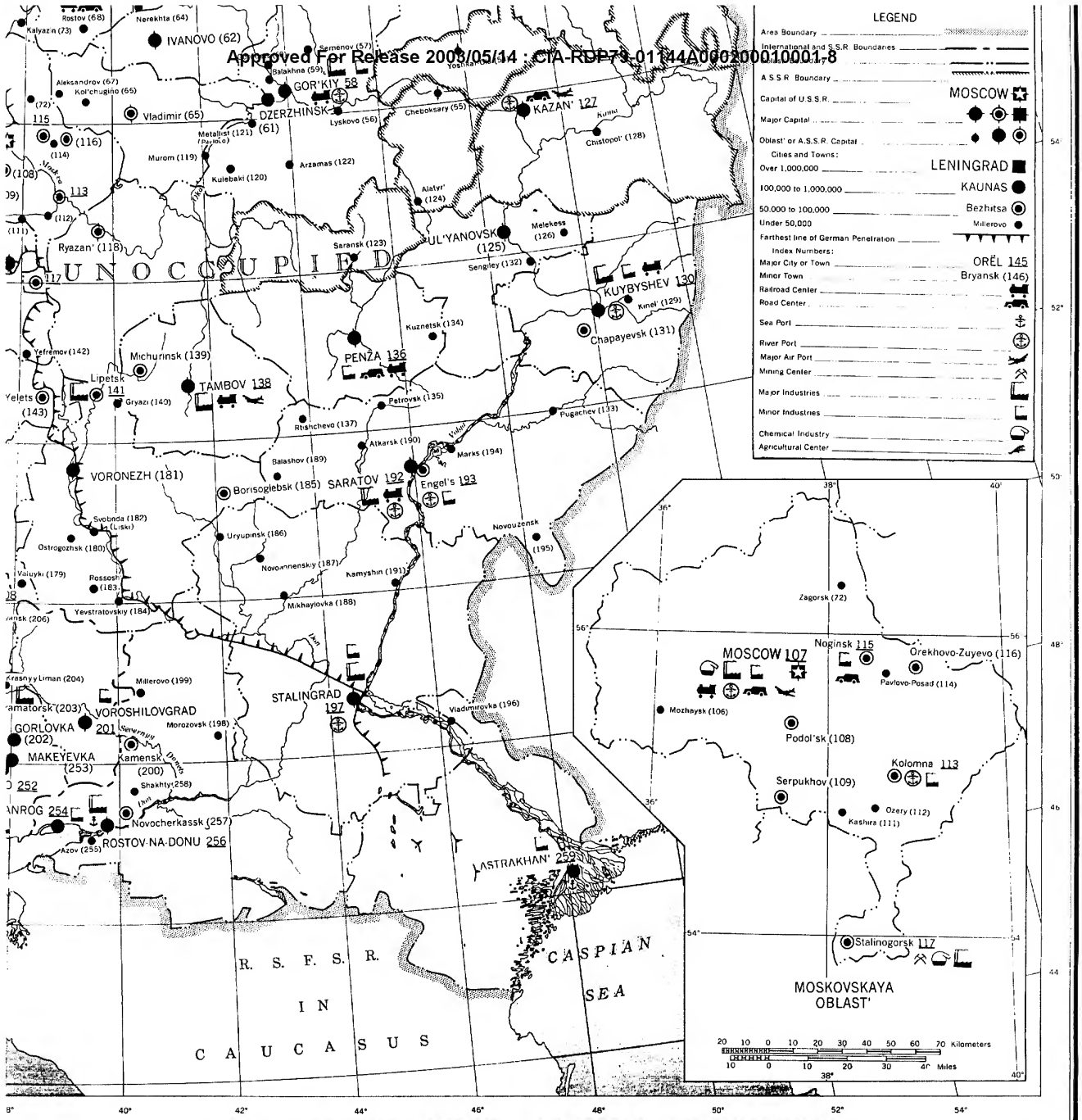


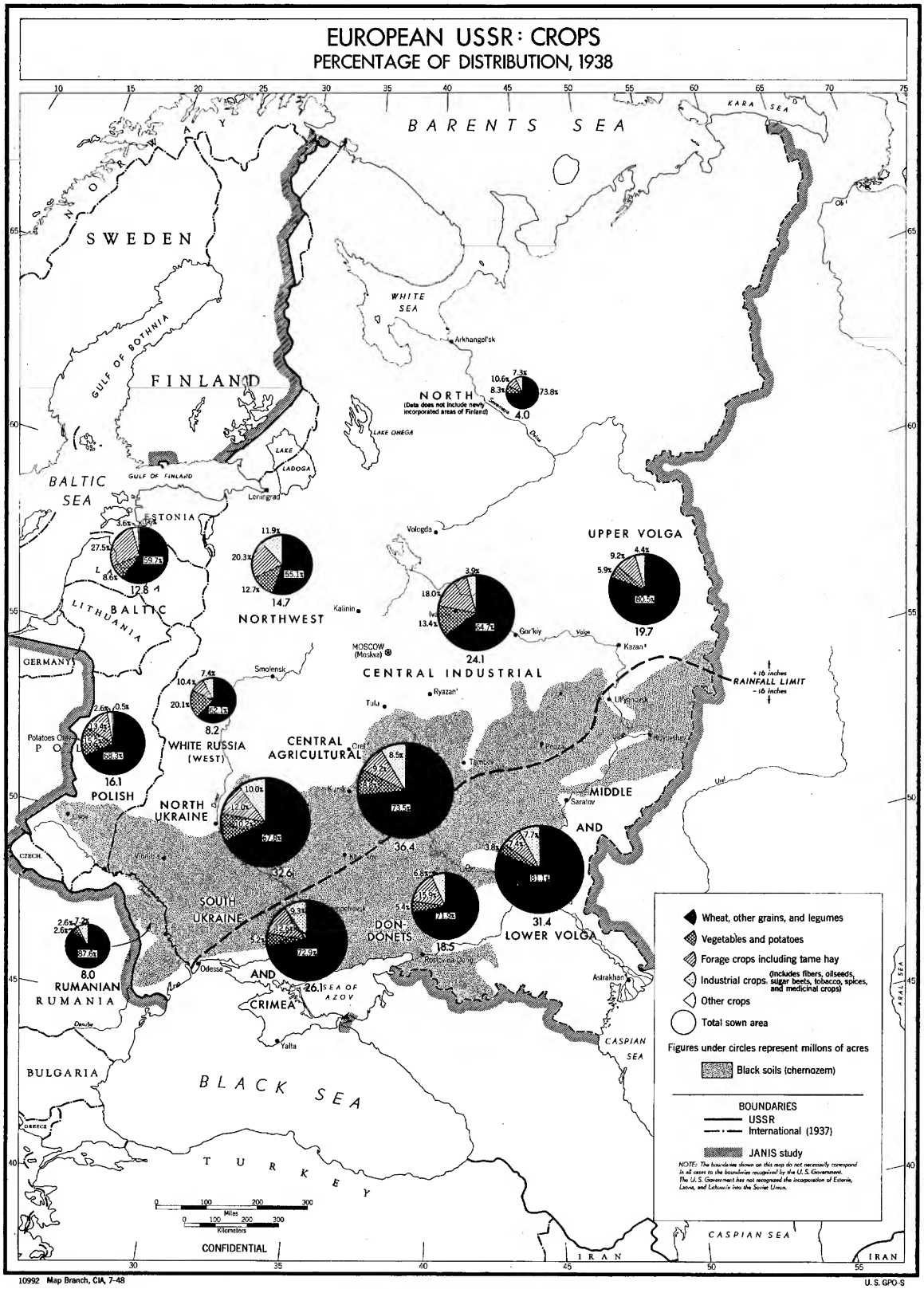


FIGURE I-14. *Crop Distribution, 1938*

TABLE I – 9

SOWN AREA BY TYPES OF FARMS, EUROPEAN USSR, 1938

Regions	Collective farms	State farms	Other farms	All farms	Percent of total sown area: Collective farms	State farms	Other farms	All farms
	1,000 acres	*1,000 acres*	*1,000 acres*	*1,000 acres*				
EUROPEAN USSR PROPER:*								
North	3,688.0	111.2	244.6	4,043.8	91.2	2.8	6.0	100.0
Northwest	13,176.4	410.9	1,092.4	14,679.7	89.8	2.8	7.4	100.0
Central Industrial	21,428.0	1,306.7	1,318.3	24,053.0	89.1	5.4	5.5	100.0
Central Agricultural	31,660.7	2,216.7	2,548.4	36,425.8	86.9	6.1	7.0	100.0
Upper Volga	18,208.3	545.1	990.9	19,744.3	92.2	2.8	5.0	100.0
Middle and Lower Volga	26,935.6	3,716.4	751.9	31,403.9	85.8	11.8	2.4	100.0
South	63,865.5	8,210.4	5,086.0	77,161.9	82.8	10.6	6.6	100.0
West	7,026.0	150.0	1,069.2	8,245.2	85.2	1.8	13.0	100.0
All European USSR proper*	185,988.5	16,667.4	13,101.7	215,757.6	86.2	7.7	6.1	100.0

* "European USSR proper" is the larger part of European USSR, which was within the Soviet frontiers at the end of 1938 and excludes territories acquired since the beginning of World War II.

wind erosion, improvement of grain seed, weed eradication, and increased efficiency of labor. These measures have been partially successful in raising the level of agricultural productivity but, from the point of view of the government's goal of restoration of agriculture to prewar levels during the years 1947 to 1950, the situation is far from satisfactory.

B. Farm products and fishing

(1) Crops

Grains are predominant in the European USSR crop pattern, and in 1938 grain acreage constituted 72% of total acreage. The sown area of wheat and rye is shown in FIGURE I–15. Forage crops hold first place among non-grain crops and accounted for about 12% of total acreage in 1938, while potatoes and vegetables occupied between 8% and 9% of the acreage. Technical crops, which provide the raw materials for the textile, sugar, vegetable oil and tobacco industries, in the same year employed nearly 8% of total acreage (TABLE I-10). European USSR is normally self-sufficient in foodstuffs and, before World War II, exported small quantities of wheat, rye, barley, oats, oilseeds, and sugar.

(2) Livestock

The livestock industry has passed through several phases of decline and recovery since World War I. The revolution, civil war, famine, and opposition to collectivization resulted in a striking decrease in numbers of livestock. There was a slight increase in numbers in the late 1930's, followed by a new decline as a result of World War II. By the end of 1945, when some recovery had already taken place, cattle numbers for the Soviet Union as a whole were 80% of the 1938 figure, horses were a little more than half, and hogs only a third of the 1938 numbers. TABLE I-11 shows the regional distribution of livestock in European USSR in 1938.

TABLE I – 10

TOTAL SOWN AREA AND PERCENTAGE DISTRIBUTION OF SPECIFIED CROPS, EUROPEAN USSR, 1938

Region	Total sown area	All wheat	Other grains and legumes	Industrial crops	Forage, tame hay	Vegetables and potatoes	Other crops	Total
	1,000 acres	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
EUROPEAN USSR PROPER:								
North	4,043.8	10.4	63.4	7.3	10.6	8.3	....	100.0
Northwest	14,679.7	7.9	47.2	12.0	20.3	12.6	....	100.0
Central Industrial	24,053.0	11.9	52.8	4.0	17.9	13.4	....	100.0
Central Agricultural	36,425.8	17.4	56.2	8.6	9.0	8.8	....	100.0
Upper Volga	19,744.3	11.9	68.5	4.4	9.2	6.0	....	100.0
Middle and Lower Volga	31,403.9	39.3	41.8	7.7	7.4	3.8	....	100.0
South	(77,161.9)	(30.9)	(39.5)	(9.0)	(13.2)	(7.4)	....	(100.0)
North Ukraine	32,616.7	18.5	49.2	10.1	12.0	10.2	....	100.0
South Ukraine and the Crimea	26,051.7	42.2	30.7	9.3	12.6	5.2	....	100.0
The Don-Donets Region	18,493.5	36.9	35.0	6.8	15.9	5.4	....	100.0
West	8,245.2	6.7	55.4	7.4	10.4	20.1	....	100.0
All European USSR proper	215,757.6	23.1	48.4	7.9	12.1	8.5	....	100.0
NEWLY INCORPORATED AREAS:								
Finnish	625.5	7.3	30.5	0.1	57.6	4.5	....	100.0
Baltic republics	12,834.6	8.0	51.7	3.6	27.5	8.6	0.6	100.0
Königsberg (now Kaliningrad), East Prussia	1,422.5	5.2	49.4	0.3	26.4	8.0	10.7	100.0
Polish	16,093.4	11.6	56.7	2.6	13.4	15.2	0.5	100.0
Rumanian	7,968.2	29.3	58.3	7.2	2.6	2.6	....	100.0
All newly incorporated areas	38,944.2	13.7	52.8	4.4	17.0	9.9	2.2	100.0
All European USSR	254,701.8	21.7	49.1	7.4	12.8	8.7	0.3	100.0

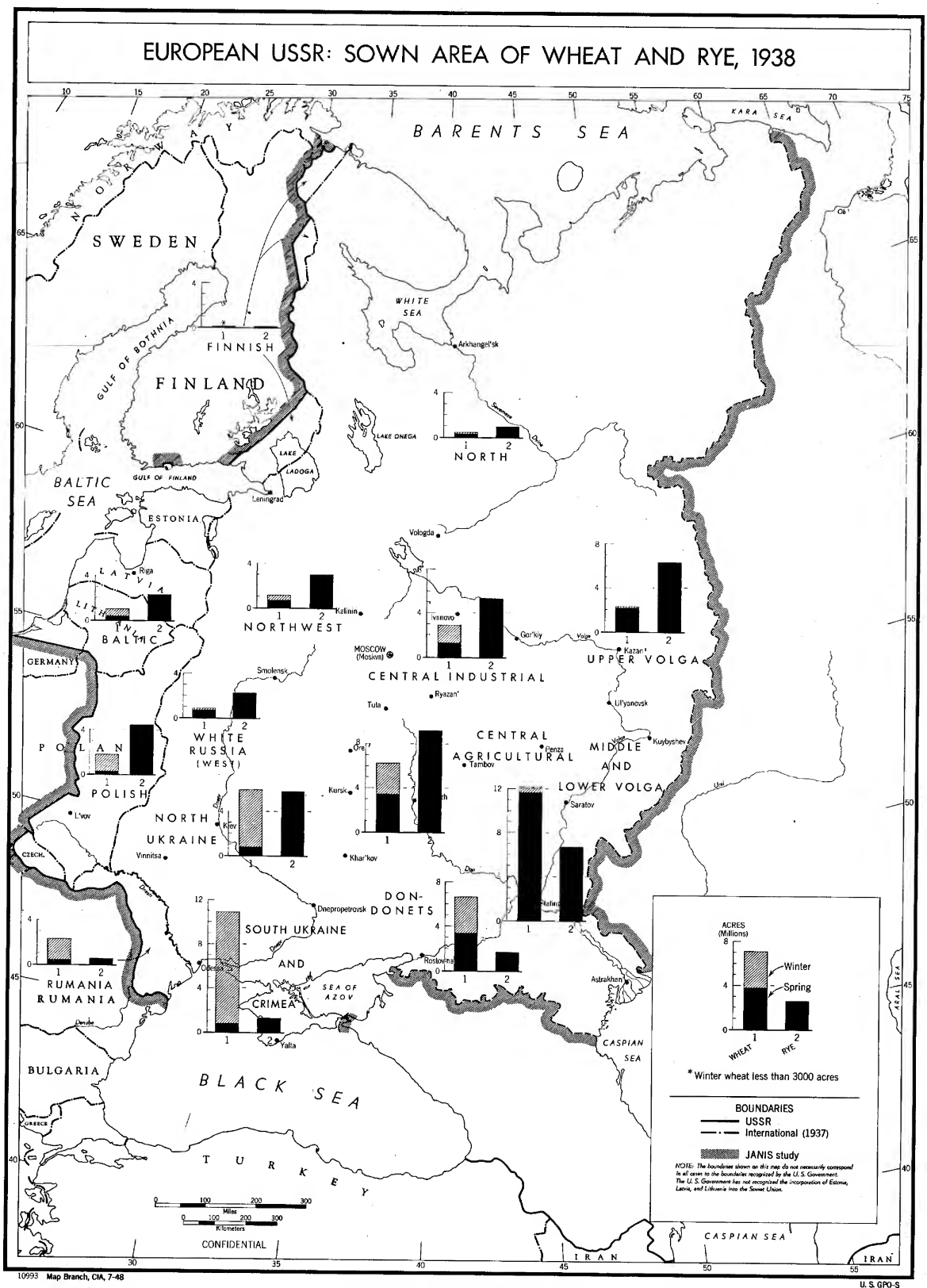


FIGURE I-15. *Wheat and rye, 1938*

TABLE I – 11

LIVESTOCK NUMBERS, TOTAL AND PER 100 ACRES OF SOWN AREA, EUROPEAN USSR, 1938

Region	Horses	Cattle	Sheep	Hogs	Horses	Cattle	Sheep	Hogs
	1,000	*1,000*	*1,000*	*1,000*	*No. per 100 acres of sown area*			
EUROPEAN USSR PROPER:*								
North	460. 1	1, 221. 4	779. 6	220. 3	11. 4	30. 2	19. 3	5. 4
Northwest	1, 135. 4	2, 765. 9	3, 063. 6	1, 885. 0	7. 7	18. 8	20. 9	12. 8
Central Industrial	1, 312. 8	3, 144. 8	3, 921. 3	1, 863. 2	5. 5	13. 1	16. 3	7. 7
Central Agricultural	1, 451. 4	3, 480. 9	3, 617. 9	2, 471. 8	4. 0	9. 6	9. 9	6. 8
Upper Volga	940. 2	1, 968. 9	2, 798. 9	1, 079. 5	4. 8	10. 0	14. 2	5. 5
Middle and Lower Volga	603. 4	2, 824. 1	4, 259. 9	965. 7	1. 9	9. 0	13. 6	3. 1
South	3, 242. 1	9, 174. 4	4, 984. 0	8, 422. 8	4. 2	11. 9	6. 5	10. 9
North Ukraine	1, 872. 6	4, 647. 8	1, 033. 9	4, 845. 8	5. 7	14. 2	3. 2	14. 9
South Ukraine and Crimea	895. 0	2, 551. 9	2, 122. 7	2, 218. 9	3. 4	9. 8	8. 1	8. 5
Don-Donets Region	474. 5	1, 974. 7	1, 827. 4	1, 358. 1	2. 6	10. 7	9. 9	7. 3
West	632. 9	1, 905. 3	1, 055. 9	1, 951. 0	7. 7	23. 1	12. 8	23. 7
All European USSR proper	9, 778. 3	26, 485. 7	24, 481. 1	18, 859. 3	4. 5	12. 3	11. 3	8. 7
NEWLY INCORPORATED AREAS:								
Finnish	43. 0	195. 0	108. 0	68. 0	6. 9	31. 2	17. 3	10. 9
Baltic**	1, 168. 7	3, 049. 4	3, 251. 4	2, 384. 7	9. 1	23. 8	25. 3	18. 6
Königsberg, East Prussia***	174. 0	554. 0	39. 0	712. 0	12. 2	38. 9	2. 7	50. 1
Polish**	1, 629. 7	4, 098. 3	2, 371. 6	2, 696. 4	10. 1	25. 5	14. 7	16. 8
Rumanian†	602. 8	734. 3	2, 400. 3	610. 7	7. 6	9. 2	30. 1	7. 7
All European USSR	13, 396. 5	35, 116. 7	32, 651. 4	25, 331. 1	5. 3	13. 8	12. 8	9. 9

* Data are for 1 January 1938.
** Data are for June 1938.
*** Data are for December 1936.
† Data are for summer 1935.

TABLE I – 12

TOTAL CATCH, BY SPECIES AND AREAS, 1934

(Metric tons)

Fishing grounds	Herring	Cisco	Large Chastik*	Small Chastik**	Cod	Salmon	Sturgeon	Flatfish	Carp	Other fish	Crabs	Total
Caspian	62, 900	204, 800	157, 800	47, 900	.....	1, 100	15, 100	....	....	5, 400	....	495, 000
Black and Azov	5, 300	11, 800	60, 900	48, 800	.....	.....	4, 500	700	....	130, 700	....	262, 700
Northern	114, 700	.....	14, 000	18, 800	93, 500	3, 800	....	2, 100	....	16, 200	....	263, 100
Ob'	.....	.....	4, 900	5, 600	.....	7, 000	1, 400	....	....	....	....	18, 900
Far East	132, 200	.....	16, 300	8, 200	9, 200	128, 500	200	10, 800	....	5, 700	12, 600	323, 700
Aral	.....	3, 400	19, 700	3, 200	.....	.....	200	....	....	.....	....	26, 500
Balkhash	.....	.....	10, 000	3, 200	.....	.....	....	....	....	.....	....	13, 200
Unclassified	2, 700	1, 500	45, 100	63, 300	.....	400	2, 000	....	1, 600	6, 400	....	123, 000
Total	317, 800	221, 500	328, 700	199, 000	102, 700	140, 800	23, 400	13, 600	1, 600	164, 400	12, 600	1, 526, 100

* Miscellaneous large fish.
** Miscellaneous small fish.

(3) Fishing

Fish-producing areas of European USSR are the Caspian Sea, the Black Sea, the Sea of Azov (Azovskoye More), the Murman coast (Murmanskiy Bereg) and the Baltic ports. Although Soviet statistics on the fishing industry vary widely, TABLE I–12 is fairly representative of published data on the catch. The fishing industry is collectivized and organized into nationally planned trusts. Virtually all fishermen belong to collective units which the fishing industry is designed to assist. The collectives receive assistance from motor-fishing stations, which play the same role that machine-tractor stations perform in agriculture. It has been reported that 130,000 laborers and 220,000 fishermen were engaged in fishing in 1941.

C. Water resources

Natural sources of surface and ground water supply are plentiful in all parts of European USSR except in the extreme south and southeast. In the west central and northern parts the climate is humid, precipitation is distributed fairly evenly throughout the year, and there is a close net of perennial streams; in the northwest, lakes are numerous. To the south and southeast precipitation gradually decreases and the severity of summer droughts increases, and three small areas bordering on the Caspian Sea and the Black Sea are semideserts.

Surface water supply is limited by the extensive freezing of rivers and lakes in winter. Periods of freezing are longest in the northeast and shortest in the southwest, and even the largest rivers are frozen for considerable periods each year.

Water-bearing rock formations are widely distributed, although in many places they are only partly developed by wells. In large parts of the country, moderate to abundant supplies of good water can be obtained at depths ranging from 20 to a few hundred feet.

D. Construction materials

European USSR has an abundance of raw materials suitable for construction purposes. Timber, widely used both as construction material and fuel, is located in belts crossing the central and northern part of the region; little or none is available on the steppes in the south or on the tundra in the far north. Sand and gravel are widely distributed as surficial deposits. Building stone, crushed rock, and cement materials are available in almost every part of the area.

E. Mineral resources

Most of the data on production and reserves have been derived from official USSR sources. Figures for total reserves appear to be very high because they include "geologically prospective" reserves, not included in total reserve figures for other countries.

(1) Minerals

Iron and manganese are the chief metallic mineral resources of European USSR. Iron ore production increased steadily during the 1930's, and in 1941 exceeded 13,000,000 tons,* amounting to 60% of the USSR total. A large part of this was produced in the Krivoy Rog district, in the Ukraine. Total reserves for European USSR are estimated at about 4,900,000,000 tons, or about 45% of the USSR total. Manganese is produced in the Nikopol' district in the Ukraine, which has acounted for nearly half of the total annual production of the USSR. Production of manganese ore in the middle 1930's exceeded one million tons per year; total reserves are estimated to exceed 400,000,000 tons. Ores for producing aluminum are third in importance among metal resources. Large reserves of low-grade ore occur in the Kola Peninsula and in the Leningrad area. Before World War II these deposits were the main sources of ore for the Soviet aluminum industry. As a result of the war, however, the industry was moved farther east, utilizing ores of higher grade in the Ural Mountains region and Asiatic USSR. Metals produced in minor amounts are: nickel, mercury, vanadium, lead, zinc, and magnesium. Deposits of copper and molybdenum minerals have been reported, but are not known to be of economic importance. Distribution of ore deposits is shown on FIGURE I-16.

Among the non-metals (FIGURE I-17), phosphates are foremost in importance. Phosphate rock is widely distributed, and the annual production in 1936 was almost 2,000,000 tons; important apatite deposits occur in the Kola Peninsula. Graphite production in the Ukraine reaches 17,000 tons of graphite rock annually, but constitutes only a minor part of the USSR total. Salt is produced in the Ukraine and in former Polish territory, and reserves are large. Potash also is produced in former Polish territory. Other non-metals produced in minor amounts are fluorspar and sulfur. The production of mica ore in Karelo-Finnish SSR was only about 900 tons in 1939.

(2) Fuels (FIGURE I-18)

Coal reserves are estimated at nearly 162,000,000,000 tons, approximately 10% of total reserves of the USSR, which holds second place in world reserves. Production reached 96,000,000 tons in 1940, mainly from the Donets Basin in the Ukraine, which supplies both bituminous and anthracite; the Moscow Basin is an important producer of lignite.

Reserves of peat are estimated at nearly 46,000,000,000 tons; production was about 22,000,000 tons in 1937. Peat is used extensively both for heating and for the generation of electric power.

Total petroleum reserves of European USSR (exclusive of former Polish territory) are estimated at somewhat more than 200,000,000 tons, or about 2.5% of the USSR total. Production in 1940, excluding production in Polish territory, was about 1,800,000 tons, or about 9% of the national total.

* Throughout Topic 9 tonnages are expressed in metric tons, 2,204.6 lb. avs., unless otherwise specified.

F. Electric power

(1) General

The electric power capacity in European USSR at the end of 1946 totaled approximately 9,500,000 kilowatts, representing over 70% of the national total. The European USSR figure includes the operating capacity of 219 identified plants of 10,000 kilowatts and over, strategic plants under 10,000 kilowatts, and an unknown number of plants under 10,000 kilowatts having a combined installed capacity of 580,000 kilowatts. Over 38% of this power is concentrated in the central and northern parts of the Central Industrial region, mainly in the districts of Yaroslavl', Moscow, Tula and Gor'kiy. Four principal transmission systems have been developed and are supplied by about 66% of the total operating capacity of European USSR. Large power stations have been built, some with capacities up to 350,000 kilowatts. The Soviets plan a 70% increase in power capacity by 1950, to a total of 16,000,000 kilowatts for the area.

(2) Power development and resources

Total capacity of all power stations in the USSR in 1917 was estimated at 1,100,000 kilowatts. Under successive economic plans, capacity was increased and, although the objectives of each Five-Year Plan were not fully realized, capacity rose to 10,500,000 by 1940 (TABLE I-13).

TABLE I – 13

DEVELOPMENT OF ELECTRIFICATION IN THE USSR

Year	Installed capacity (at end of year)	Production	Average plant factor	Increase in production over previous year
	1,000 kw.	*1,000,000 kwhr.*	*Percent*	*Percent*
1913	1,098	1,945	20.2*	....
1921	1,228	520	4.8*	....
1926	1,586	3,608	27.8	23.4
1930	2,876	8,368	36.9	34.4
1935	6,880	25,900	44.9	23.2
1940	10,520	48,230	54.9	10.8
1941	8,220	50,200	55.0	4.1
1942	6,220	33,310	58.5	−33.6
1943	8,120	36,230	58.5	8.8
1944	9,700	44,710	57.3	23.4
1945	10,700	49,900	56.4	11.6
1946	12,500**	54,900	54.0	10.0
1947*	14,500	63,700	53.9	16.0
1948*	16,900	70,600	51.3	10.8
1949*	19,500	76,600	48.0	8.5
1950*	22,400	82,000	44.6	7.0

* Estimated.

** Over 70% (9,484,500 kw.) of this total was located in European USSR.

The USSR lost about 6,000,000 kilowatts capacity through wartime destruction and evacuation. Postwar recovery was rapid, and by the end of 1946 the installed capacity in European USSR was 9,500,000 kilowatts, or approximately 70% of the national total. FIGURE I–19, the power map of European USSR (1944 to 1946) shows: 1) limits of German penetration, 2) locations of all known plants of 10,000-kilowatt capacity or over, 3) locations of smaller plants of strategic importance, 4) transmission systems.

European USSR is constructing 6,665,000 kilowatts of capacity under the terms of the Fourth Five-Year Plan (1946 to 1950), and complete restoration of war-damaged plants is scheduled for 1948.

(3) Transmission systems

There are four principal power networks in European USSR which, together with a much smaller system in the vicinity of Khar'kov, total approximately 6,243,500 kilowatts, distributed as follows: 1) 236,000 kilowatts (3.8%) in the Murmansk system, which serves the electrified Murmansk-Kandalaksha railway, plus mines and industries of the area; 2) 1,189,000 kilowatts (19.0%) in the Leningrad system, serving primarily industrial users in and around Leningrad; 3) 2,918,000 kilowatts (46.7%) in the Moscow-Upper Volga system, consumed mostly by industries in and around Moscow; 4) 1,733,500 kilowatts (27.8%) in the Dnepr-Donets system, serving mines and industries of the Donets Basin; and 5) 167,000 kilowatts (2.7%) in the Khar'kov system, serving local industry. These systems are not connected; a transmission line from Leningrad to Moscow via Kalinin is planned, but extent of progress is unknown.

The main networks, plus the Khar'kov system, include about 1,700 kilometers (1,056 miles) of 220-kilovolt line, of which 160 kilometers (99 miles) are double; 6,000 kilometers (3,728 miles) of 110-kilovolt line, of which 1,300 kilometers (808 miles) are double; and 600 kilometers (373 miles) of 150-kilovolt line, including 160 kilometers (99 miles) of double line. Some areas also have considerable lengths of 35- and 22-kilovolt line.

(4) Thermal plants

Steam plants produce approximately 82% of the total electric power output of the European USSR. Turbogenerators of 50,000 kw. capacity are standard for condensing steam stations, but recent reports indicate that units of 100,000 kilowatt capacity have been built. Boilers used range in size from 16,000 to 27,000 square feet of heating surface.

In addition to steam electric power generating plants, heat and power stations having a total capacity of over 1,500,000 kilowatts have been developed. They supply heat and electricity to surrounding domestic and industrial consumers. Simultaneously they feed into regional electric networks, acting as base load stations of planned power systems.

The use of internal combustion engines is slight. Diesel-operated plants of small capacity have been reported in the Baltic states. In the eastern part of European USSR the largest diesel-equipped installation, with two diesels in operation, is the Syzran' heat and power plant which has an estimated capacity of 15,000 kilowatts. No information is available concerning locations of over 700 diesel-powered generating units obtained from the United States.

(5) Hydroelectric resources, development, and projects

The water power potential of the Soviet Union has been estimated to be about 280,000,000 kilowatts. Of these resources, only 0.4% had been exploited by 1940, but present plans of the Soviet government call for greater development of hydroelectric power.

The first important hydroelectric station in Russia was the Volkhov station built to service Leningrad and its industries. Another station, the Svir' III, was added to the Leningrad network, and the Svir' II station is now under construction.

In the Kola region a series of hydroelectric dams on the Tuloma and Niva Rivers furnish practically all the electric power requirements of Murmansk.

Large dams were built at Shcherbakov (Rybinsk) and Uglich, which are to be important sources of power for the industrial area around Moscow.

The largest of the USSR hydroelectric stations is the Dnepro-GES station on the Dnepr (Dnieper) River near Zaporzh'ye. Above this station at Kremenchug a larger station is to be built which will furnish power to the southern industrial area and regulate the water supply of the Dnepr-GES installation.

In the middle Volga area, the largest of all such projects, the Kuybyshev system, is under way at the Samara loop. It is projected to be the largest aggregate in the world with an installed capacity of 3,000,000 kilowatts and an estimated yearly output of 14,500,000,000 kilowatt-hours. It is intended to supply large industrial areas such as Moscow, Gor'kiy, and the Tatar Republic.

Several hydroelectric plants were acquired with the annexation of territory formerly belonging to Finland and Germany. In the Karelian isthmus, close to the present border, are two large hydroelectric stations on the Vuoksi River. There are two more stations on the Alle River in Kaliningradskaya Oblast' (formerly part of East Prussia).

(6) Consumption of electric power

TABLE I-14 presents information on prewar consumption of electric power with estimated figures for 1950. No statistics are available on present consumption. Municipal electrification has not kept pace with electric power development. Industry, transport, and rural economy have remained in approximately the same relationship, with industry consuming by far the greatest portion of the generated power.

TABLE I - 14

CONSUMPTION OF ELECTRICITY IN THE USSR

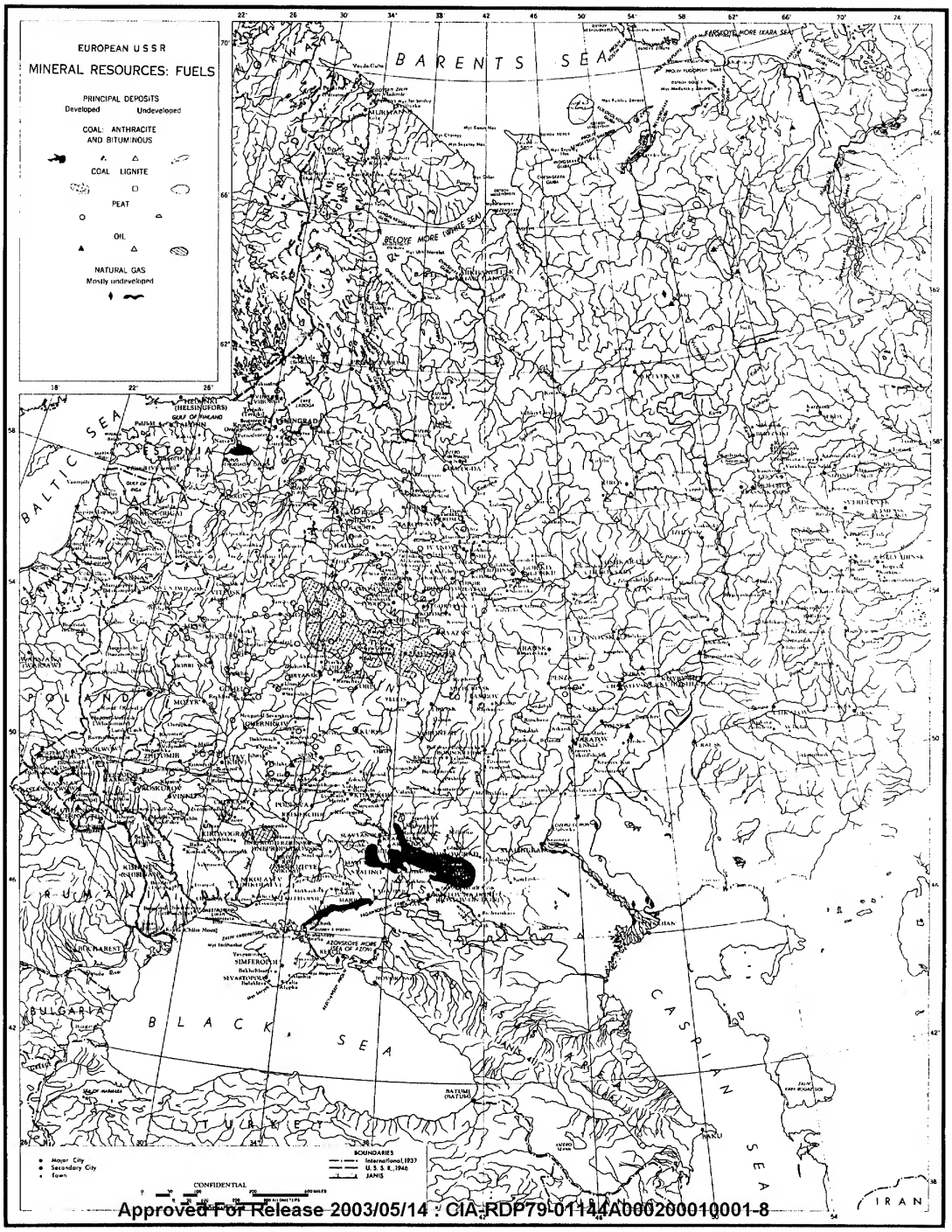
Users	1928	1932	1935	1937	1950*	1928	1932	1935	1937	1950*
	Kwhr. in billions					*Percent*				
Industry	3. 43	9. 30	17. 97	25. 28	58. 00	68. 5	68. 7	69. 4	69. 5	70. 7
Transport	0. 10	0. 26	0. 57	1. 02	2. 50	2. 0	1. 9	2. 2	2. 8	3. 0
Municipal	0. 96	2. 20	3. 76	4. 91	7. 50	19. 1	16. 2	14. 5	13. 5	9. 2
Rural	0. 04	0. 09	0. 19	0. 33	2. 80	0. 8	0. 7	0. 7	0. 9	3. 4
Transmission losses	0. 35	0. 96	1. 93	2. 62	5. 90	7. 0	7. 1	7. 5	7. 2	7. 2
Power stations	0. 13	0. 73	1. 48	2. 22	5. 30	2. 6	5. 4	5. 7	6. 1	6. 5
Total	5. 01	13. 54	25. 90	36. 38	82. 00	100. 0	100. 0	100. 0	100. 0	100. 0

* Estimated under fourth Five-Year Plan.

FIGURE I-16
MINERAL RESOURCES: METALS
JANIS 40

FIGURE I-17
MINERAL RESOURCES: NONMETALS
JANIS 40

FIGURE I-18
MINERAL RESOURCES: FUELS
JANIS 40
[redacted]



EUROPEAN U.S.S.R.

ELECTRIC POWER RESOURCES

(DATA BASED ON MATERIAL OF 1944-46)

LOCATION OF 235 PLANTS: 10,000 KW AND OVER, AND STRATEGIC PLANTS UNDER 10,000 KW

LEGEND

POWER PLANTS

● ⊕-uc O——Operating; under construction; planned

CODE ACCOMPANYING POWER PLANT SYMBOLS

*——Heat & Power

(50)——Number in Table IX–46

DHS——Diesel; hydro; steam

20,000 kw——Capacity in kilowatts where known. (All power is 3-phase, 50-cycle AC, except when noted DC or AC & DC.)

AC DC——Current produced

——— – – – ——Transmission Lines, 50 cycles: Operating, probable (Networks incomplete).

BOUNDARIES

——Designated regions

——Farthest German penetration

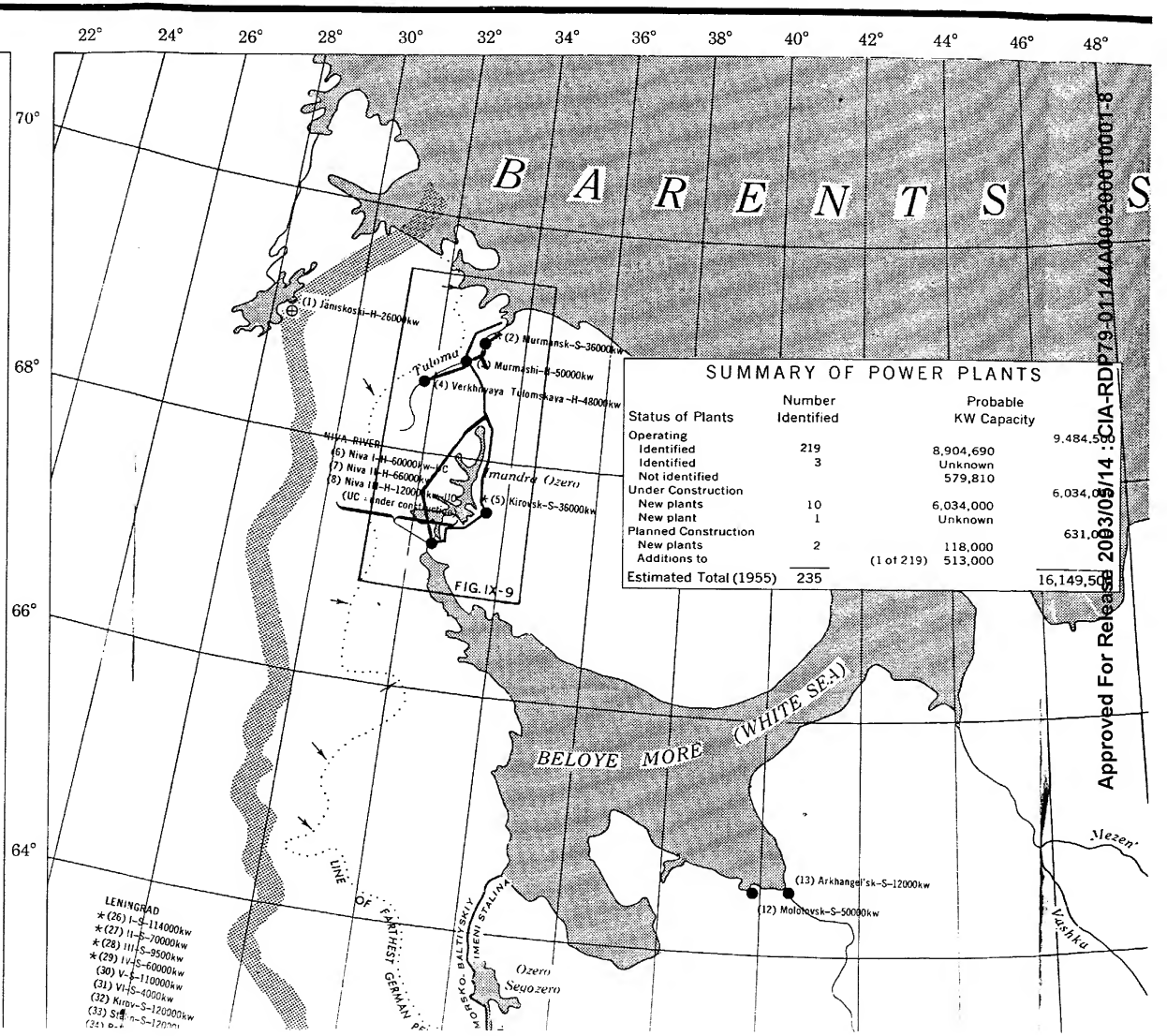
——JANIS boundary

I (1,809,000 kw) — Designated region with estimated operating capacity

Note: For Table IX–46 and Figures IX–9 to IX–13 see Chapter IX.

ESTIMATED KILOWATT CAPACITY

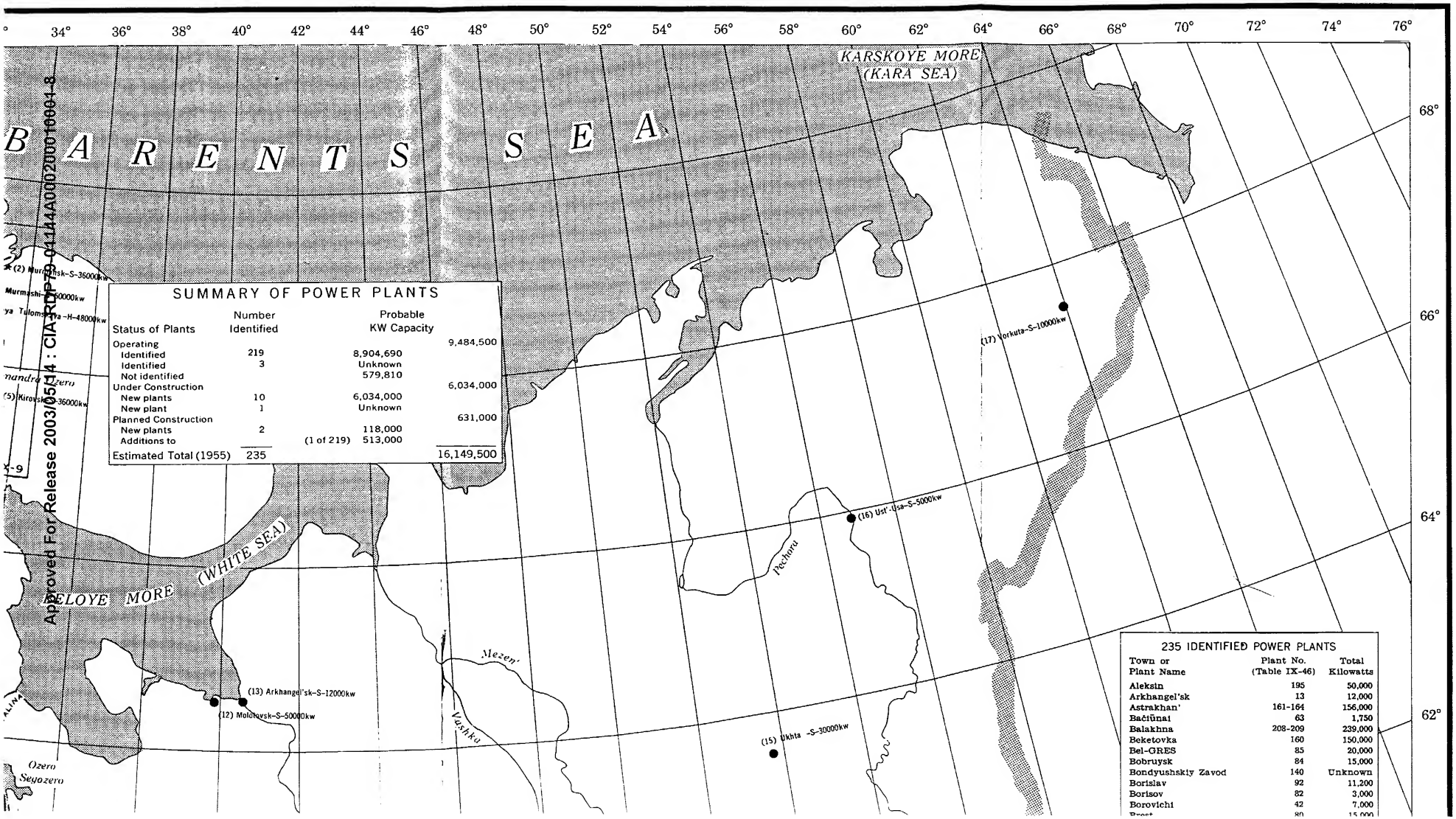
DESIGNATED REGIONS	OPERATING–1946*	PROBABLE** CAPACITY–1955
I NORTH & NORTHWEST	1,809,000	2,313,000
II WEST	438,000	438,000
III SOUTH	1,991,000	3,104,000
IV SOUTHEAST	278,000	278,000
V VOLGA	1,165,500	6,165,500
VI CENTRAL INDUSTRIAL	3,635,000	3,681,000



SUMMARY OF POWER PLANTS

Status of Plants	Number Identified	Probable KW Capacity	
Operating			9,484,500
Identified	219	8,904,690	
Identified	3	Unknown	
Not identified		579,810	
Under Construction			6,034,000
New plants	10	6,034,000	
New plant	1	Unknown	
Planned Construction			631,000
New plants	2	118,000	
Additions to		(1 of 219) 513,000	
Estimated Total (1955)	235		16,149,500

FIGURE I-19
POWER MAP OF EUROPEAN USSR
JANIS 40
CONFIDENTIAL



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Operating			9,484,500
Identified	219	8,904,690	
Identified	3	Unknown	
Not identified		579,810	
Under Construction			6,034,000
New plants	10	6,034,000	
New plant	1	Unknown	
Planned Construction			631,000
New plants	2	118,000	
Additions to	(1 of 219)	513,000	
Estimated Total (1955)	235		16,149,500

235 IDENTIFIED POWER PLANTS

Town or Plant Name	Plant No. (Table IX-46)	Total Kilowatts
Aleksin	195	50,000
Arkhangel'sk	13	12,000
Astrakhan'	161-164	156,000
Bačiūnai	63	1,750
Balakhna	208-209	239,000
Beketovka	160	150,000
Bel-GRES	85	20,000
Bobruysk	84	15,000
Bondyushskiy Zavod	140	Unknown
Borislav	92	11,200
Borisov	82	3,000
Borovichi	42	7,000
Brest	80	15,000

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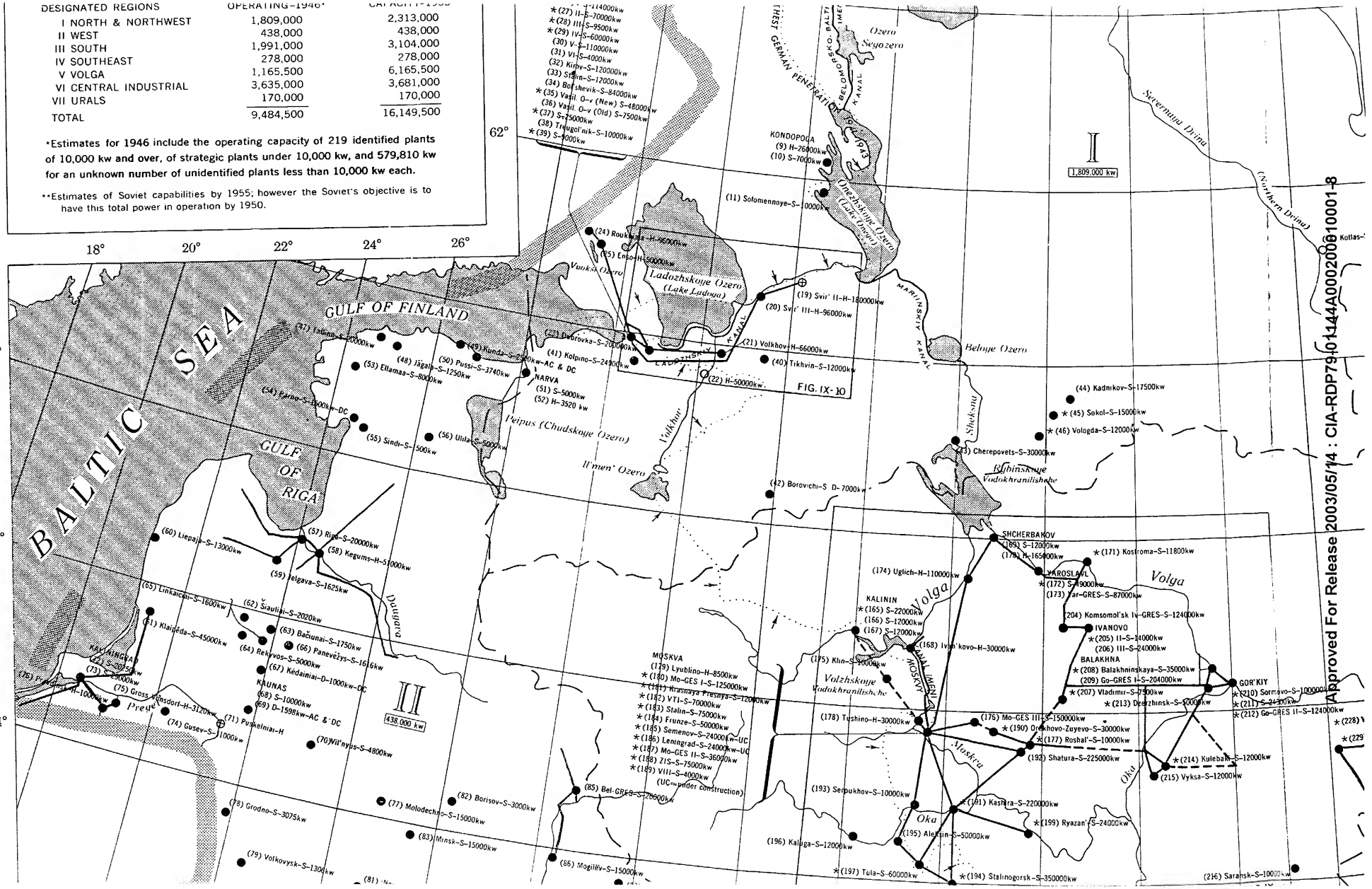
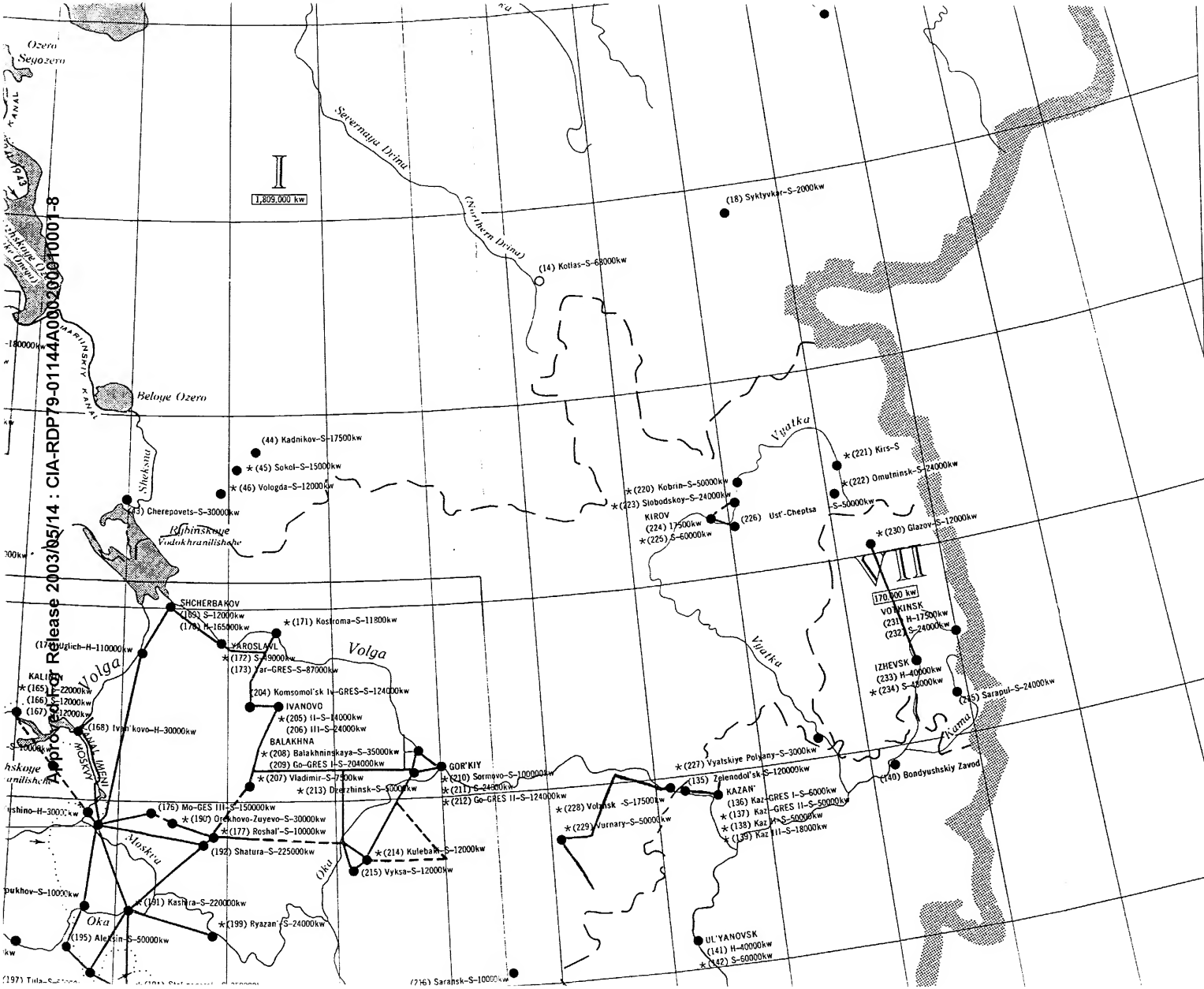
DESIGNATED REGIONS	OPERATING–1946*	CAPACITY–1955**
I NORTH & NORTHWEST	1,809,000	2,313,000
II WEST	438,000	438,000
III SOUTH	1,991,000	3,104,000
IV SOUTHEAST	278,000	278,000
V VOLGA	1,165,500	6,165,500
VI CENTRAL INDUSTRIAL	3,635,000	3,681,000
VII URALS	170,000	170,000
TOTAL	9,484,500	16,149,500

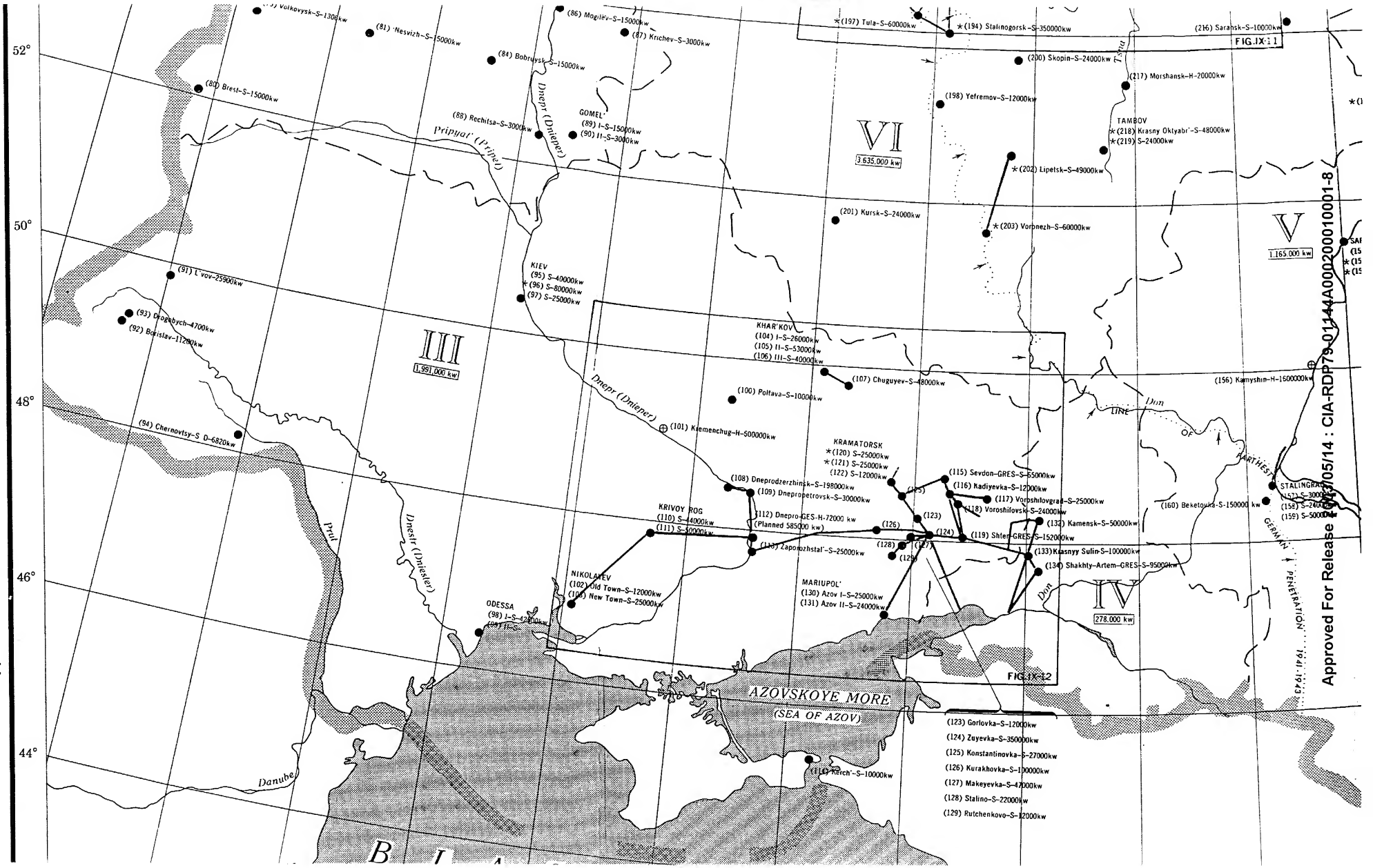
*Estimates for 1946 include the operating capacity of 219 identified plants of 10,000 kw and over, of strategic plants under 10,000 kw, and 579,810 kw for an unknown number of unidentified plants less than 10,000 kw each.

**Estimates of Soviet capabilities by 1955; however the Soviet's objective is to have this total power in operation by 1950.





Bobruysk	84	15,000
Bondyushskiy Zavod	140	Unknown
Borislav	92	11,200
Borisov	82	3,000
Borovichi	42	7,000
Brest	80	15,000
Chapayevsk	150-151	13,500
Cherepovets	43	30,000
Chernovtsy	94	6,820
Chuguyev	107	48,000
Dneprodzerzhinsk	108	198,000
Dnepro-GES	112	585,000
Dnepropetrovsk	109	30,000
Drogobych	93	4,700
Dubrovka	23	200,000
Dzerzhinsk	213	50,000
Ellamaa	53	8,000
Enso	25	50,000
Glazov	230	12,000
Gomel'	89-90	18,000
Gor'kiy	210-212	248,000
Gorlovka	123	12,000
Grodno	78	3,075
Gross Vonsdorf	75	3,120
Gusev	74	11,000
Ivan'kovo	168	30,000
Ivanovo	205-206	38,000
Izhevsk	233-234	88,000
Jägala	48	1,250
Janiskoski	1	26,000
Jelgava	59	1,625
Kadiyevka	116	12,000
Kadnikov	44	17,500
Kalinin	165-167	46,000
Kaliningrad	72-73	49,250
Kaluga	196	12,000
Kamensk	132	50,000
Kanyshin	156	1,600,000
Kashira	191	220,000
Kashpirovka	144	5,000
Kaunas	68-69	11,598
Kazan'	136-139	124,000
Kėdainiai	67	1,000
Kegums	58	51,000
Kerch'	114	10,000
Khar'kov	104-106	119,000
Kirov	224-225	77,500
Kirovsk	5	36,000
Kirs	221	Unknown
Kiev	95-97	145,000
Klaipeda	61	4,500
Klin	175	10,000
Kobrin	220	50,000
Kolpino	41	24,000
Komsomol'sk Iv-GRES	204	124,000
Kondopoga	9-10	33,000
Konstantinovka	125	27,000
Kostroma	171	11,800
Kotlas	14	68,000
Kramatorsk	120-122	62,000
Krasnaya Glinka	145	1,900,000
Krasnyy Sulin	133	100,000
Kremenchug	101	600,000
Krichev	87	3,000
Krivoy Rog	110-111	94,000
Kulebaki	214	12,000
Kunda	49	2,500
Kurakhovka	126	100,000
Kursk	201	24,000
Kuybyshev	146-148	168,000
Leningrad	26-39	683,000
Liepaja	60	13,000
Linkaičiai	65	1,600
Lipetsk	202	49,000
L'vov	91	25,900
Makeyevka	127	47,000
Mariupol'	130-131	49,000
Minsk	83	15,000
Mo-GES III	176	150,000
Mogilëv	86	15,000
Molodechno	77	15,000
Molotovsk	12	50,000
Morshansk	217	20,000
Moskva	179-189	503,500
Murmansk	2	36,000



Morshansk	217	20,000
Moskva	179-189	503,500
Murmansk	2	36,000
Murmashi	3	50,000
Narva	51-52	8,520
Nesvizh	81	15,000
Nikolayev	102-103	37,000
Niva river	6-8	246,000
Odessa	98-99	42,500
Omutninsk	222	24,000
Orekhovo-Zuyevo	190	30,000
Panevezys	66	1,616
Pärnu	54	1,500
Perevoloki	149	1,500,000
Poltava	100	10,000
Pravdinsk	76	10,000
Puskelniai	71	Unknown
Püssi	50	3,740
Rechitsa	88	3,000
Rekyvos	64	5,000
Riga	57	20,000
Roshal'	177	10,000
Roukhiala	24	96,000
Rutchenkovo	129	12,000
Ryazan'	199	24,000
Saransk	216	10,000
Sarapul	235	24,000
Saratov	153-155	148,000
Serpukhov	193	10,000
Sevdon-GRES	115	65,000
Shakhty-Artem-GRES	134	95,000
Shatura	192	225,000
Shcherbakov	169-170	177,000
Shter-GRES	119	152,000
Siauliai	62	2,020
Sindi	55	1,500
Skopin	200	24,000
Slobodskoy	223	24,000
Sokol	45	15,000
Solomennoye	11	10,000
Stalingrad	157-159	104,000
Stalino	128	22,000
Stalinogorsk	194	350,000
Svir' II	19	180,000
Svir' III	20	96,000
Syktyvkar	18	2,000
Syzran'	143	15,000
Tallinn	47	20,000
Tambov	218-219	72,000
Tikhvin	40	12,000
Tula	197	60,000
Tushino	178	30,000
Uglich	174	110,000
Ukhta	15	30,000
Ulila	56	5,000
Ul'yanovsk	141-142	100,000
Ust'-Cheptsa	226	50,000
Ust'-Usa	16	5,000
Verkhnyaya Tulomskaya	4	48,000
Vil'nyus	70	4,800
Vladimir	207	7,500
Volkhov	21	66,000
Volkovysk	79	1,306
Vologda	46	12,000
Vol'sk	152	25,000
Volzhsk	228	17,500
Vorkuta	17	10,000
Voronezh	203	60,000
Voroshilovgrad	117	25,000
Voroshilovsk	118	24,000
Votkinsk	231-232	41,500
Vurnary	229	50,000
Vyatskiye Polyany	227	3,000
Vyksa	215	12,000
Yaroslavl'	172-173	136,000
Yefremov	198	12,000
Zaporozhstal'	113	25,000
Zelenodol'sk	135	120,000
Zuyevka	124	350,000
Not known	22	50,000
TOTAL IDENTIFIED PLANT CAPACITY (Operating, under construction, & planned)		15,569,690
UNIDENTIFIED PLANT CAPACITY		579,810

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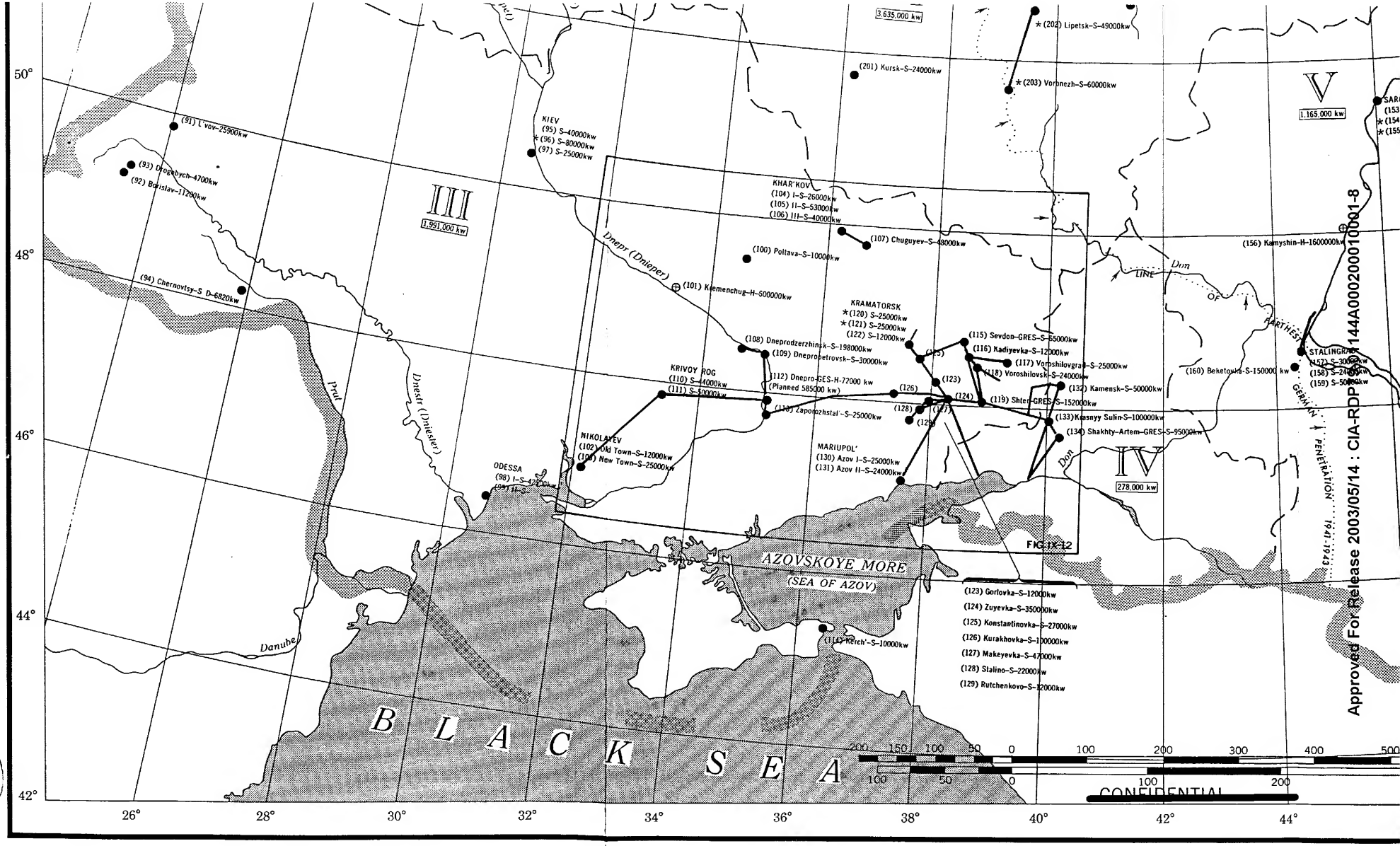

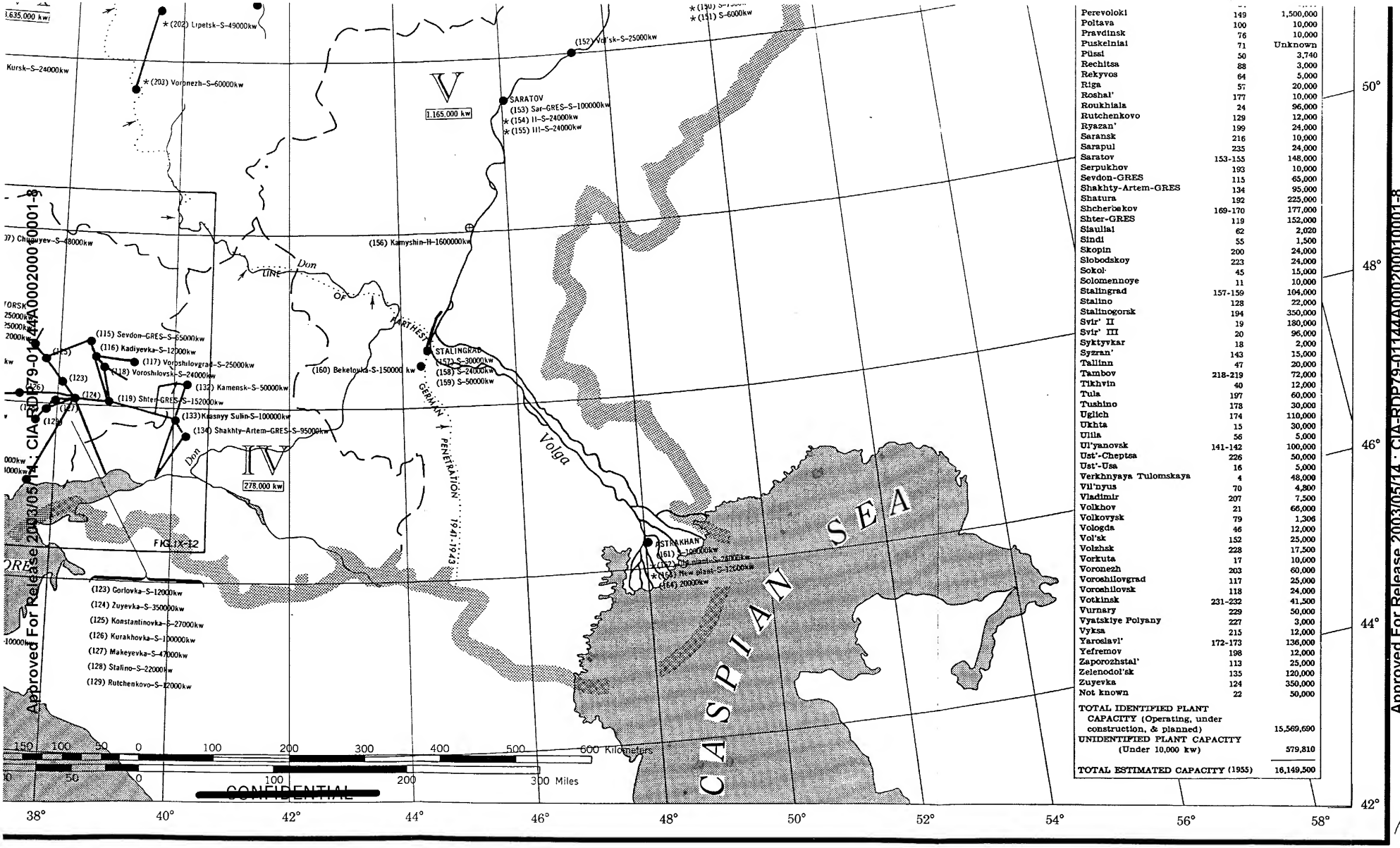

Perevoloki	149	1,500,000
Poltava	100	10,000
Pravdinsk	76	10,000
Puskelniai	71	Unknown
Püssi	50	3,740
Rechitsa	88	3,000
Rekyvos	64	5,000
Riga	57	20,000
Roshal'	177	10,000
Roukhiala	24	96,000
Rutchenkovo	129	12,000
Ryazan'	199	24,000
Saransk	216	10,000
Sarapul	235	24,000
Saratov	153-155	148,000
Serpukhov	193	10,000
Sevdon-GRES	115	65,000
Shakhty-Artem-GRES	134	95,000
Shatura	192	225,000
Shcherbakov	169-170	177,000
Shter-GRES	119	152,000
Siauliai	62	2,020
Sindi	55	1,500
Skopin	200	24,000
Slobodskoy	223	24,000
Sokol	45	15,000
Solomennoye	11	10,000
Stalingrad	157-159	104,000
Stalino	128	22,000
Stalinogorsk	194	350,000
Svir' II	19	180,000
Svir' III	20	96,000
Syktyvkar	18	2,000
Syzran'	143	15,000
Tallinn	47	20,000
Tambov	218-219	72,000
Tikhvin	40	12,000
Tula	197	60,000
Tushino	178	30,000
Uglich	174	110,000
Ukhta	15	30,000
Ulila	56	5,000
Ul'yanovsk	141-142	100,000
Ust'-Cheptsa	226	50,000
Ust'-Usa	16	5,000
Verkhnyaya Tulomskaya	4	48,000
Vil'nyus	70	4,800
Vladimir	207	7,500
Volkhov	21	66,000
Volkovysk	79	1,306
Vologda	46	12,000
Vol'sk	152	25,000
Volzhsk	228	17,500
Vorkuta	17	10,000
Voronezh	203	60,000
Voroshilovgrad	117	25,000
Voroshilovsk	118	24,000
Votkinsk	231-232	41,500
Vurnary	229	50,000
Vyatskiye Polyany	227	3,000
Vyksa	215	12,000
Yaroslavl'	172-173	136,000
Yefremov	198	12,000
Zaporozhstal'	113	25,000
Zelenodol'sk	135	120,000
Zuyevka	124	350,000
Not known	22	50,000
TOTAL IDENTIFIED PLANT CAPACITY (Operating, under construction, & planned)		15,569,690
UNIDENTIFIED PLANT CAPACITY (Under 10,000 kw)		579,810
TOTAL ESTIMATED CAPACITY (1955)		16,149,500

ERS-AMS 6-48

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FIGURE I-20
FERROUS METALLURGY
JANIS 40

FIGURE I-21
MACHINE BUILDING INDUSTRY
JANIS 40

FIGURE I-22
MUNITIONS INDUSTRY
JANIS 40

FIGURE I-23
PETROLEUM AND CHEMICAL INDUSTRIES
JANIS 40

G. Manufacturing

Prerevolutionary Russia was predominantly agricultural, with little industrial development. World War I and the revolution reduced even that small industry, and the prewar level of industrial development was not regained until 1926. During the period of the New Economic Policy (1921 to 1928) and the initiation of the Five-Year Plans in 1928 the Soviet economy (including agriculture) was gradually built up, and at the beginning of World War II the USSR had the third largest industry in the world, following those of the United States and Germany.

The dominant position of European USSR in the prewar Soviet industrial economy is shown by the following approximate location of total USSR industry in 1940:

Area	Percent
European USSR	
Moscow-Gor'kiy	30.0
Ukraine	18.5
Leningrad	14.5
White Russia	2.0
Other USSR	35.0

The Donets Basin in the Ukraine, with developed production of good iron ore and coal, and also manganese, was the heart of the Soviet steel and coke industry; with some production in the central region, European USSR as a whole accounted for about 70% of total Soviet output of pig iron, raw steel and rolled steel products (Figure I-20). The Ukraine also is a center for heavy mining and metallurgical machinery.

Dispersed new capacity has not displaced the dominant position in general manufacturing of the Moscow-Leningrad-Gor'kiy central industrial region with its supporting concentration of trained labor and transportation. Moscow and Leningrad each had over three times the prewar industrial output of any other USSR city. This remains the principal area for production of consumers goods. The region is the center for priority output of heavy machinery, machine tools and electrical-communications equipment (Figure I-21); it includes the bulk of the automotive industry and more than one-half of total USSR railroad rolling stock production. European USSR produced an estimated 50% to 75% of total Soviet munitions and armament in 1942-1944, but may now be secondary in over-all Soviet direct armament and munitions capacity (Figure I-22). In the early part of 1945, plants in European USSR were producing an estimated 56% of total Soviet airframes and 48% of aircraft engines. The area's aluminum capacity was drastically cut during the war; plants east of the Urals are believed to be now producing the bulk of Soviet aluminum. Five of the six major prewar Soviet shipyards were located in this area. Coal processing and petroleum refining (Figure I-23) are major factors in the importance of European USSR in the Soviet high-priority production of synthetic rubber and in output of basic chemicals.

The Third Five-Year Plan, beginning in 1938, stressed the development of new industrial capacity to the eastward. New, and in some cases better, sources of raw materials were developed, to become the basis for dispersed industrial complexes which are now major elements in over-all Soviet production. At the beginning of hostilities with Germany, this trend was augmented by removal of armament, machine building and chemical plants from western USSR into the Volga valley and to the Urals and beyond. Despite such removals, it is estimated that, as result of extensive damage by the Germans and destruction by the Soviets themselves to prevent German exploitation, at least 25% of prewar USSR industrial capacity was destroyed.

Replacement of industrial capacity reestablished to the eastward or destroyed, has included both new construction and utilization of plants and equipment seized by the Soviet forces, and some reported return of removed plant. Reconstruction has lagged behind plan and the initial goal of full reconstruction by 1950 has been officially modified, but there has been considerable restoration of European USSR industrial capacity. The volume of capital construction work in 1946 in the Soviet economy as a whole was reported to be 117% of that in 1945; most of this activity took place in European USSR. By the end of 1946, 21 blast furnaces, 71 coke batteries and corresponding steel capacity had been recommissioned in the Ukraine. Of a prewar total of 279 large coal or iron mines, 138 were in operation. Donets Basin coal output had reached a reported 52% of prewar production. Ukraine electric generating capacity, standing at less than 1% upon the departure of the Germans, reached nearly 70% of prewar by the end of 1946. A continuing principal and critical lag was in rolling stock and other railroad facilities.

There is inadequate basis for accurately evaluating the net effect on this area's industrial significance of the development of new capacity eastward, wartime destruction and removals, and, on the other hand, the rebuilding of capacity in the area toward the end of the war and thereafter. The relative importance of European USSR must be considered to have been reduced, both over-all and in terms of relatively permanent removal of certain strategic production; further decrease is projected in Soviet plans for progressive industrial build-up outside western USSR. However, it is significant that the Soviet plan calls for European USSR output to be rebuilt by 1950 to more than one-half of total steel production. While this might be regarded as an interim measure pending implementation of long-range plans to develop new output elsewhere, it indicates the present production effectiveness of European USSR and the probability that major decline in the relative importance of the area, with its established pattern of industrial production, urbanization and transport, will be a longer-term rather than a short-term development.

H. Commerce and finance

(1) Commerce

(a) General.—The state plans, directs and controls in detail the internal and external trade of the USSR. Both the import and export programs are dominated by the needs of the state rather than those of its citizens, by the stress put on the rapid expansion of industrial potential as contrasted with providing consumer goods, and by military and political strategic policies.

(b) Foreign trade.—The foreign trade program requires that the ministries concerned with various industries and agriculture submit to the State Planning Commission (Gosplan) estimates of their future exportable surpluses. These estimates are coordinated by Gosplan, existing price contracts and current world price fluctuations are taken into consideration, and a minimum amount which is likely to be realized on all exports is determined. To this figure is added the country's estimated returns from gold production, and the estimated foreign exchange to be received from goods and services rendered representatives of foreign countries. From this total all external debt payments due within a given year are deducted. The balance establishes the limit of foreign purchases to be

TABLE I – 15

TOTAL EXPORTS AND IMPORTS,* 1929 TO 1938, ALL USSR

	Exports				Imports			
	Agricultural		Industrial		Consumption goods		Production goods	
	Mil. rubles	*% of total*	*Mil. rubles*	*% of total*	*Mil. rubles*	*% of total*	*Mil. rubles*	*% of total*
1929	1, 572. 1	38. 8	2, 473. 7	61. 2	394. 2	10. 2	3, 407. 6	88. 4
1930	1, 899. 0	41. 8	2, 640. 3	58. 2	455. 0	9. 8	4, 083. 5	88. 1
1931	1, 499. 1	42. 1	2, 054. 0	57. 9	222. 5	4. 6	4, 503. 1	93. 0
1932	803. 4	31. 9	1, 714. 8	68. 1	250. 5	8. 1	2, 752. 4	89. 3
1933	623. 9	28. 8	1, 543. 6	71. 2	79. 7	5. 2	1, 385. 8	90. 3
1934	521. 3	28. 4	1, 311. 1	71. 6	157. 2	15. 4	860. 8	84. 6
1935	429. 9	26. 7	1, 179. 4	73. 3	136. 6	12. 9	920. 6	87. 1
1936	275. 4	20. 3	1, 083. 7	79. 7	142. 5	10. 5	1, 210. 0	89. 5
1937	547. 6	31. 7	1, 181. 0	68. 3	121. 5	9. 1	1, 219. 8	90. 9
1938	485. 5	36. 4	846. 4	63. 6	172. 1	12. 1	1, 250. 8	87. 9

* Agricultural and industrial exports are classified according to the official usage of the Soviet statistical publications on foreign trade. The classification of imports into consumption and production goods is based upon official sources which did not classify all commodities into these two groups every year, with the result that for certain years the total does not add up to 100 percent.

made abroad by the Ministry of Foreign Trade. The amount that will be available is then apportioned among the various branches of the national economy in accordance with priorities assigned by the Gosplan, first priorities for imports going to industries which increase war potential, such as metallurgy, machine tools, chemistry, and transport.

Soviet trade objectives of self-sufficiency, governmental monopoly of foreign trade, retaliation against measures of other nations, obtaining credits, and economic penetration, were reflected in Soviet foreign trade statistics for the period 1929-38 (TABLE I-15).

Imports during this period were chiefly capital goods equipment and manufactures. Exports were foodstuffs, raw materials, semimanufactures, timber and lumber products, furs, and petroleum and oil products.

(c) Internal commerce.—The State Planning Commission directs and allocates the flow of commodities within the USSR from surplus to deficiency areas. For example, the industrial Moscow region, deficient in foodstuffs, is partially fed from normally food-surplus areas such as the Ukraine and White Russia. These two republics in turn receive manufactured goods from areas such as Moscow and the Urals.

The retail distribution of foodstuffs and consumer goods in the USSR is accomplished through the following outlets: 1) state-owned ration stores, 2) state-owned commercial stores, 3) state-owned commission shops, 4) cooperative stores, and 5) various open markets, where excess farm products and a simple type of consumers' goods are bartered.

(2) Finance

The monetary unit of the USSR is the ruble (*rubl*) which is divided into 100 Kopecks (*Kopeika*). The peculiarities of the Soviet price system make it difficult to compute a purchasing-power-parity rate of exchange for the ruble. On 19 July 1937, an official rate of 5.30 rubles to one dollar was established. During the war, a diplomatic rate of exchange of 12 rubles to the dollar was set, and was later supplemented by the so-called military rate of 18 rubles to the dollar.

The Gosbank, which has a network of thousands of branches throughout the country, is the center for clearing operations and is the source of short-term credit to the economy. The Gosbank not only allots credit to industrial enterprises, but also has the responsibility for seeing that the credit is used as planned and that the enterprise fulfills its quota, and therefore is a powerful factor in the execution of Soviet planning. All enterprises of the USSR are under obligation to keep their cash reserves with the Gosbank, and funds from savings banks in which individuals have personal accounts are turned over directly to Gosbank. Long-term investment of budgetary funds and funds accumulated by individual enterprises in the economy is channeled through four All-Union banks. The bulk of savings deposits is accepted by special saving institutions (*Sberkassy*).

10. PEOPLE AND GOVERNMENT

The Union of Soviet Socialist Republics is a multinational state which spans the Eurasian Continent. The European portion of the USSR, extending to the Ural Mountains in the east and to the Caucasus in the south, is the heart of the entire country. It includes the part of the population which is the largest in number and the most advanced in culture. Although significant agricultural and industrial regions lie outside the bounds of this area, European USSR includes the bread basket of the country and the majority of its industrial centers.

A. Population

European USSR has a population of 129 millions, or approximately 68 percent of the total population of the USSR and an approximate density of 78 persons per square mile (FIGURE I-24). This population has a higher birth rate and a younger age composition than the populations of Western Europe and America. The constant increase in population creates a pressure against the natural resources of the country and considerably taxes the food supply. At the same time it provides a manpower reservoir for industry and the armed forces.

B. National elements

The Russian elements constitute the dominant force in the population of the area. The most important stock is the so-called Great Russian, followed by the Ukrainian and Belorussian (White Russian) (FIGURE I-25). The languages of these peoples belong to the Eastern Slavic language group, but there are significant differences among the three in both spoken and written forms. The physical characteristics of the three Russian types show considerable variance. Commonly Russians have a medium stature, tending toward the squat, fair to light complexion (darker in the case of the Ukrainians), round faces, and sturdy bone structures. Among the significant minority groups of the Western USSR are the Finno-Ugric elements, with a concentration in the Karelo-Finnish

SSR and with scattered Finno-Ugric groups among the Great Russians. The Karelians use Finnish as a literary language but have their own dialect. Estonians, Letts, and Lithuanians constitute the majority in their respective Baltic Republics, and exist in minorities in other parts of the European USSR. A large group of Germans was formerly located along the Volga; they were removed and scattered in the course of World War II. Many other Germans who were located in other parts of European USSR were also moved eastward during the war. Jews constituted a significant minority in the urban portions of Western USSR, but suffered tremendous losses at the hands of the invading Germans. Tatar elements are numerous on the Volga, where the Kazan' and Astrakhan' groups are prominent. The Crimean Tatars were exiled to Siberia and Central Asia during the war. Among the other significant minority groups in the Western USSR are the Moldavians, Poles, Greeks, and Bulgarians.

C. Religion

The greater portion of the churchgoing population in European USSR adheres to the Russian Orthodox Church. There are significant minorities of Roman Catholics (especially in recently annexed western territories), Protestants (particularly Lutherans and Baptists), Jews, and Mohammedans (notably among the Tatars). The number of church members and believers is not known. The number of churches now functioning is only a small fraction of those in existence before the Revolution. The government in recent years has appealed to religious motives in an attempt to enlist the support of religious communities for the Soviet program. The ties of the Russian Orthodox Church with religious groups outside the USSR have been strengthened in recent years by Soviet authorities, presumably as one means of enhancing Soviet prestige and influence abroad.

D. Education

The Soviet educational system has concentrated on two aims: to develop a literate population, and to provide the trained personnel needed in industry and agriculture. Illiteracy is reputed to have been reduced to about 20% by adult educational programs and by the introduction of compulsory elementary education (four years of schooling). Only a small proportion of the population has received secondary education. Curricula above the elementary level are technical rather than general and emphasize vocational training. Control of higher schools is divided between the specialized Ministries on the one hand and the Union Republic Ministries of Higher Education on the other. In both systems training is directed toward practical ends. Elementary education is free, but fees have been introduced at higher levels, supplemented by a system of state stipends. The Soviet authorities have undertaken to abolish coeducation in secondary schools. Students are drafted for certain trade schools, which supply cadres for industry and transportation.

E. Labor

The composition of the Soviet labor force has been altered by the successive Five-Year Plans. The proportion of persons engaged in farming—in earlier times three-fourths of all workers—has declined to less than 50 percent of the total working force and is exceeded by the number of manual and office workers. Workers are organized in large unions of the industrial type. Various administrative functions are performed through trade-unions. The unions have limited functions in negotiating collective agreements; they cannot challenge the economic decisions of the state by means of collective bargaining. Consequently, collective bargaining has only a slight relationship to the workers' income. In addition, the officials of the unions are in fact semiofficial representatives of the Government. The chief emphasis of Soviet trade-unions is placed on increasing production rather than raising wage rates.

F. Government

The Soviet State is constitutionally a federal democracy. However, neither the federal nor the democratic element has achieved a consistent development. The USSR is composed of 16 Union Republics, eight of which come within the scope of this study (FIGURE I-26). The Supreme Soviet of the USSR is the highest state organ. It is directly elected by voters in Union-wide elections. The elections of 1938 and 1946 were similar. Before the elections all but one of the candidates were eliminated in each election district, so that the voter was presented with no alternative. A high percentage of eligible voters appeared at the polls, and almost 100 percent of the voters cast their ballots for the "bloc of Party and non-Party candidates."

The Supreme Soviet is a bicameral body consisting of the Soviet of the Union, elected on a population basis, and the Soviet of Nationalities, in which representation is based on nationality units. The Supreme Soviet has important legislative and appointive powers, but the short and routine character of the sessions indicates that deliberation by the Supreme Soviet does not materially affect the government's program.

The Presidium of the USSR Supreme Soviet is a body composed of 32 members. It acts for the Supreme Soviet when that body is not in session and is entrusted with the "interpretation" of the Constitution and laws as well as other important powers. The Chairman is the titular head of the Soviet State. Since the 16 Deputy Chairmen of the Presidium are the titular heads of the Union Republics, the Presidium is an important device for knitting together the Soviet federal system. The Presidium meets regularly to perform its several honorific, emergency, judicial, and appointive functions. Although the Presidium exercises the power to alter the administrative organization and to appoint administrative heads, it apparently does not serve as a device for coordinating administrative activities.

The function of coordination is largely a prerogative of the Council of Ministers, a group of about 60 department heads. The Council of Ministers has a chairman and 10 Deputy Chairmen. This group of presiding officers is especially important because all but one of the 11 are currently members of the *Politburo* of the Communist Party. Since most of the Deputy Chairmen have no individual ministerial responsibility, it is probable that the function of administrative coordination, especially important because of the large number of specialized ministries, is performed at this level. The Economic Councils, formerly active in coordinating administrative activities, have apparently disappeared.

Ministries (formerly People's Commissariats) are the basic administrative mechanism of the Soviet regime, although committees, commissions, and other organs are also used. Ministerial organization emphasizes the per-

sonal responsibility of department and division heads for the conduct of their assigned spheres. Ministers share some of this responsibility with advisory collegiums, however, which include the chief administrative assistants in their ministries.

USSR Ministries are of two types: All-Union and Union Republic. All-Union Ministries, the most centralized, operate throughout the USSR by means of directly subordinate organs. Union Republic Ministries of the USSR, on the other hand, operate through the Union Republic Ministries of the various Republics and hence are less centralized. They administer directly certain enterprises of All-Union scope. All-Union Ministries are organized for the control of basic industry, foreign trade, transportation, and communications. Light industry, consumers' goods industries, internal trade, and agriculture are placed under the Union Republic system, as are most of the "political" functions (foreign affairs, armed forces, internal affairs, state security, justice, state control, and finance).

The Union Republics have state structures like the USSR system. Theoretically sovereign, the Republics in practice exercise little independence in their political-economic activities. The government of a Union Republic is headed by a unicameral Supreme Soviet, chosen in elections similar to those for the USSR Supreme Soviet. A Presidium and Council of Ministers exercise functions on the lower level analogous to those of the USSR organs. The Ministries of Union Republics are of two types. The Union Republic Ministries of the Republic are the operating agencies for USSR Ministries of the same name, except that Ministries in Union Republics controlling foreign affairs and armed forces have operated within a very narrow sphere since their organization in 1944. The Republic Ministries of Union Republics have no center of control in the Soviet Government, and hence are supposed to operate with considerable autonomy. Experience indicates, however, that even in general education, the most important field reserved to Republic Ministries, the autonomy of the Republics is limited by Party and other devices for securing uniformity.

Autonomous Republics have the unicameral Supreme Soviets, Presidiums, and Councils of Ministers characteristics of the other Soviet Republics. The Councils of Ministers are smaller than those of the Union Republics because not all Ministries represented on the Union Republic level are organized on the Autonomous Republic level. There are no exclusively Autonomous Republic functions, and consequently all Ministries in Autonomous Republics are responsible both to the Ministry of the Union Republic and to the Council of Ministers of the Autonomous Republic.

Local government is organized for areas varying in size from large regions, such as *oblasts*, to *raions*, cities, and villages. Each government is usually responsible to the one on the next higher level. *Soviets* (councils of workers' deputies) are elected as the primary governing organ on all levels. These soviets meet at intervals to hear reports and adopt local measures. They function administratively through officers and executive committees (*ispolkom*). Under the latter there are various departments to administer the local government. Some of the All-Union Ministries, and the Republic Ministries of Internal Affairs and State Security, have "administrations" attached to these local governments. The *oblast* governments are principally planning and supervisory bodies; the *raion* and city governments constitute the operating agencies.

G. Legal system

The legal system of the USSR is based on an inheritance from Roman law, adapted to the needs of a socialist society. The legal system has become more centralized with the installation of USSR organs such as the Ministry of Justice and the Prosecutor General's Office. The All-Union element in the codification of laws has become increasingly prominent. Though Soviet courts function on an independent basis, they have no power to rule on the validity of governmental enactments. All judges are elected. The judges in the lowest courts, the people's courts, are elected directly by voters for a three-year term; judges of higher courts, by the Soviets for a five-year term. Juries are not used, but all courts are collegial. For cases of original jurisdiction the courts employ one judge and two "public representatives" (people's assessors). Cases are usually heard on review by three judges.

The Supreme Court of the USSR functions through specialized panels: civil, criminal, military, railroad, and water transport. The last three panels are review benches for Union courts functioning among the armed forces and the semimilitarized transportation workers. The Supreme Court, like all Soviet courts, has original jurisdiction, limited to important cases. Its function as a review court is more important, with cases coming up for review only with the consent of the President of the Court or the Prosecutor General of the USSR. Unlike other Soviet courts, the Supreme Court of the USSR meets in plenary sessions with the participation of the Prosecutor General of the USSR and the Minister of Justice. The Supreme Court adopts this means to hand down to inferior courts general directives on judicial practice.

Republican, *oblast*, and *raion* (People's) courts handle both criminal and civil cases. They function as courts of original jurisdiction and as review courts, except for the *raion* courts, which have no review functions.

H. Police

The police system of the Soviet Union has two main arms, the regular police and the security police. Though at times the two have been brought under the control of the same department, they are distinct in operation. The regular (uniformed) police is the Workers' and Peasants' Militia, operating as part of the MVD. It performs the usual law-enforcement tasks of police everywhere: maintenance of order, protection of life and property, patrol of streets, apprehension of suspects. The militia is attached to local organs of government, except for the "departmental" militia, which operates under contract to various factories and institutions requiring special protection of their property. The border and convoy troops are also controlled by the MVD but cooperate closely with the MGB (security police).

The security police have been a prominent part of the Soviet order since 1917. Through successive transformations the security police have remained a bulwark of the regime, closely tied in with Party rule. They are now organized under the Ministry of State Security, although the Ministry of Internal Affairs is closely connected with security work. The stated purpose of the security police is to combat counterrevolution and espionage, to protect the borders of the USSR from infiltration, and to preserve the institutions of the state. In 1934 the powers of the security police were reduced slightly with the abolition of the special OGPU courts by which persons could be tried, convicted, and punished (or executed) entirely outside

the regular judicial proceedings. The NKVD received the power, exercised through a special council, to exile and detain in concentration camps for periods up to five years persons found guilty of endangering the security of the state. In wartime NKVD and NKGB units operated closely with the armed forces in regard to military police functions, air-raid precautions, border protection, counter-intelligence, and government of occupied areas.

I. Communist Party

The Communist Party of the Soviet Union is the dominant force in the political life of the country. Since there are no rival parties and no independent pressure groups, the Party has an unchallenged hold on the state machinery. The Party is guided by a latter-day Marxism embracing the philosophy of dialectical materialism as interpreted by Lenin and Stalin.

The Party adapts its propaganda to specific internal and international situations, so that the propaganda of any one time never mirrors completely the ideology of the Party. Through its monopoly of the media of communications the Party is capable of implanting its ideas with little competition from abroad and with only such resistance at home as is engendered by inertia and by the gap between the official picture of Soviet life and the reality experienced by Soviet citizens.

The Communist Party of the Soviet Union is organized in a hierarchy which bears few traces of the federalism built into the state structure. "Democratic centralism" is the official organizational principle governing Party organization. The democratic part of the formula implies the election of higher organs by lower and the responsibility of elected organs to the electors. In practice the democracy is attenuated, but the "centralist" part of the formula is well developed. It calls for the strict execution by lower Party organs of decisions rendered by higher organs.

The Party rules provide that an All-Union Party Congress is to be assembled once in three years, and an All-Union Party Conference every other year. In actual fact, the meetings have been held less frequently; the last Congress (the eighteenth) was held in 1939, and the last Conference (the eighteenth) in 1941. The Congress elects for interim control a Central Committee, which is superior in authority to a Party Conference. The Central Committee at present consists of about 140 members and candidates, the latter having no voting rights. The Committee meets at intervals for discussion of important state and Party policies and activities. The permanent Party apparatus includes the Secretariat, a group of five leading Party figures who manage day-by-day Party activities. Stalin has wielded his power largely through his position as Secretary General of the Party Secretariat. The *Orgburo,* a somewhat larger group, deals with the important organizational problem of the All-Union Party and of the principal subordinate organizations. The leading policy group is the *Politburo,* which consists of 14 top Party leaders. It deals with the important problems of policy, internal and international, so far as they are not handled on a personal basis by Stalin and the specialists concerned. Attached to the Central Committee are various administrations for special matters (such as personnel, schools, and others). In addition there is a Commission of Party Control which checks upon the implementation (by both Party and state organs) of Party decisions. It sends to local Party organs a number of "commissioners" who, free from local control, check on the activities of these Party units.

The Party is broken down by regional subdivisions corresponding to the general state structure (FIGURE I-26). Each Union Republic with the exception of the RSFSR has its own Party, Congress, Central Committee, and Party apparatus. On the level of *oblasts, raions,* and cities the Party is governed by a conference or meeting of local Party representatives and, for every-day administration, by a Committee and Secretariat.

Primary Party units are founded in all government, cooperative, and public organizations. These units in Ministries lack the control functions which they exercise in production organizations. In Ministries the Party organs are told to leave policy alone (since at the top level the Central Committee itself steers the governmental apparatus) and to concentrate on checking fulfillment of plans and elimination of bureaucratic practices. In production organizations, on the other hand, this role of the Party units is more important, since they may be called to account for the state of work in an enterprise. The differentiation of managerial prerogatives from Party and trade-union powers on this level has given the Soviet leaders much trouble; the tendency is to enhance the role of the managers.

After the abolition of the Comintern in 1943 the Soviet Communist Party has ceased to maintain overt links with foreign Communist Parties. Nevertheless a high degree of coordination continues to be evident in world-wide Communist activities.

11. HEALTH AND SANITATION

A. Environment

(1) Water

At the end of 1938 there were reported to be in the USSR, as a whole, 411 cities with central water systems and about 14,000 kilometers (8,700 miles) of mains. New systems have been established and additions have been made to many existing systems since 1938. The war interrupted the expansion of developed waterworks but such work was continued in unoccupied areas. Only a few rural areas have piped distribution systems. Villages obtain water almost exclusively from wells, the majority of which are of wooden construction and of inferior design.

The predominant sources of water supply in the USSR are rivers, which are numerous in the European USSR. In 1936, the USSR obtained water from various sources in the following proportions: rivers 35.2%, springs 20.7%, subsoil springs 6.7%, wells 10.5%, artesian wells 13.3%, artesian springs 4.7%, and from combinations of these sources 8.9 percent. Much of the available water supply is inadequately protected from contamination, particularly in rural areas.

(2) Waste disposal

As late as 1930 only about 42 cities in the entire USSR had sewerage systems. Rural communities are without such systems and primitive methods of waste disposal are still practiced. By the end of 1938 some 107 cities were reported to have sewerage systems with about 5,000 kilometers (3,100 miles) of mains. However, this total represented only three-fifths of the cities in the USSR with populations exceeding 50,000 in January 1939. No information is available concerning construction of new sewerage systems nor of reconstruction of existing facilities destroyed or damaged during the war.

(3) Animals

Some 54 species of mosquitoes have been identified in European USSR. Many are numerous enough to become serious pests in some localities but the only important vectors of diseases in the area are five species of *Anopheles* which are incriminated in the spread of malaria, as follows: *A. maculipennis maculipennis, A. labranchiae atroparvus, A. messeae, A. sacharovi,* and *A. hyrcanus hyrcanus.*

There are 39 species of flies recorded from the USSR. Some species act as mechanical transmitters of helminthic ova, amebic cysts, and the organisms of such diseases as cholera, enteric diseases, eye diseases, and various types of myiasis. German occupation forces in White Russia reported flies to be so numerous as completely to cover food or any exposed parts of the body. Sandflies are numerous in the Crimea where they are vectors of sandfly fever. Lice and fleas are numerous; they serve as vectors of plague, relapsing fever, typhus, and trench fever. Cockroaches and ants contaminate food mechanically. Numerous species of ticks are reported and tick-borne encephalitis is recorded from forested regions of European USSR. The mites, *Sarcoptes scabiei* and *Demodex folliculorum,* are common throughout European USSR. Rodents are very numerous. They are important as hosts of fleas, lice, and mites, and are involved in the spread of plague and typhus.

Among the animals dangerous to man are bears, wolves, and two species of vipers. Rabid dogs, cats, and wolves are numerous and about 70,000 persons per year are bitten in the Soviet Union. Spiders and scorpions may constitute a threat to the well-being of personnel in some parts of European USSR.

(4) Plants

Scant information has been found concerning poisonous plants in the area under study. A large number of potentially allergenic plants have been identified. Individuals who exhibit pollen sensitization in the United States may be expected to develop allergic symptoms in European USSR.

(5) Food

The diet of the Soviet population is determined not only by population growth and considerable fluctuations in domestic crop yields but also by state control which includes detailed direction of agricultural production, varying payments in kind from collectivized farming, rationing or other regulation of food consumption, and stockpiling for military or international bargaining purposes. This has tended to narrow former extremes in the Russian diet, but at a level well below Western standards of adequacy.

Bread is the staple of the Soviet dietary. Meat is relatively scarce. About 75% of the milk distributed in the larger cities is pasteurized. Transportation difficulties make fruits and vegetables scarce in the cities. Citrus fruits are in short supply throughout the USSR. Before World War II, the Soviet Union ranked first in world production of beet sugar and was an exporter. The collectivized canning industry has been expanding.

Collective feeding is a widespread practice in the Soviet Union. In 1931 collective feeding embraced 42.8% of all industrial workers, 25% of office workers, and 80% of university students. The scientific investigation of collective feeding is carried on by the Central Institute for Nutrition which works out nutritional standards for different classes of workers. The dietary of rural populations is richer in carbohydrates and poorer in proteins than that of urban dwellers. Food sanitation measures are enforced only in large industrial centers and large cities.

B. Public health and medical facilities

(1) Public health organization

The central administrative body for the protection of health within a republic is the People's Commissariat for Public Health *(Narkomzdrav)* which controls the health departments of *oblasts* and *krays* (regions) within the republic. City health departments (*gorzdravotdels*) are controlled by the health department of their respective *oblast* or *kray. Raion* (rural or borough) health departments *(rayzdravotdels)* are under the jurisdiction of the *oblast* or *kray* health departments, or in the case of a city district, under the city health department. The governing bodies *(selosoviets)* of villages and small towns exercise supervision over all hospitals and sanitary establishments which are maintained in the *selosoviet* budget. The Commissariats of Transportation and of Defense have subsidiary health administrations which are independent of the Commissariat for Public Health of the USSR.

(2) Hospitals and medical institutions

Hospital facilities are far from adequate in the USSR, which had 877,296 beds in 1941, excluding those in sanatoria, nurseries, and dispensaries. More than half the total number of beds were in cities and the rural populations are without adequate facilities. The number of beds per 1,000 population in 1941 was 8.2 in cities and 1.47 in rural regions. Medical research was carried on (1941) by 19,500 scientific workers in 223 separate institutes. Medical education in 1941 was centered in 72 institutions of which 46 are in European USSR.

(3) Medical personnel

There were 130,348 physicians in the USSR in 1941. Physicians, dentists and veterinarians are classed as higher medical personnel (professional) while "feldshers" (doctor's assistants), dental technicians, nurses, and midwives are classed as middle medical personnel (subprofessional). Every physician is required to take a course of three to six months postgraduate instruction every three years. No information is available as to the physician-population ratio. In addition to physicians, dentists and veterinarians have important places in the Soviet health program. In 1937 there were 10,508 dentists in European USSR, 88% of the total number in the Soviet Union.

(4) Rest and recreation facilities

The USSR has numerous health resorts where mineral waters, climatic treatment, balneotherapy, and radioactive mud baths are available. Many of the important health resorts in European USSR are in the Crimea. About one-third of the 1,400 mineral springs of Europe are in European USSR. Rest and recreation facilities are provided in every factory, and trade-unions have established such facilities in many places away from the factories.

(5) Social service agencies

Except for the Red Cross and the Red Crescent, social service activities are largely supported and controlled by the government. Medical service is free to all, and governmental social service as a part of the national medical service program includes such features as social insurance and care for mother and child.

C. Diseases

(1) Diseases of military importance

Malaria is prevalent in some parts of European USSR. The *falciparum* type is seen particularly in the Ukraine, Crimea, Lower Volga region, and Caucasus. Sandfly fever is encountered in the Crimea. Typhus is endemic and occurs periodically in epidemic outbreaks. Trench fever is found in European USSR. Bacillary dysentery is endemic but the amebic form is only occasionally seen in this area. Various types of enteritis and common diarrheas are widespread. Venereal diseases are common. Frostbite is a hazard in the northern parts of the area.

(2) Diseases of potential military importance

Endemic diseases in the European part of the USSR include relapsing fever, tick-borne encephalitis, cholera, and plague. Diseases which could be introduced include filariasis, kala-azar, and Japanese B-encephalitis.

(3) Diseases of minor military importance

Typhoid fever, scarlet fever, diphtheria, and measles are endemic.

(4) Diseases common among the civil population

In addition to the diseases mentioned above the following are present: Tuberculosis, influenza, and such helminthic infections as ascariasis, enterobiasis, teniasis, trichinosis, and hookworm disease.

(5) Miscellaneous diseases

This group includes tularemia, leprosy, trachoma, smallpox, rabies, and anthrax.

D. The Baltic Republics

Available information concerning the Baltic Republics of Estonia, Latvia and Lithuania is incomplete and largely out-of-date.

E. Recommendations

Recommendations of special importance for military forces operating in European USSR include:

1) All water supplies should be considered unsafe for drinking or bathing unless they have received proper treatment and protection from subsequent contamination.
2) Proper disposal of wastes.
3) Proper handling of food supplies and supervision of food handlers.
4) Venereal disease control.
5) Adequate measures to prevent frostbite.
6) Mosquito control to prevent malaria.
7) Control of flies to prevent certain enteric, eye, and skin diseases.
8) Control of sandflies to prevent sandfly fever.
9) Control of louse-borne diseases, typhus, and relapsing fever.
10) Control of tick-borne encephalitis.
11) Control of rodents and fleas to prevent plague and typhus.
12) Cholera control measures.

12. AVIATION

This topic is discussed in Chapter XII, a limited distribution supplement published as JANIS 40-1.

13. MAPS AND SURVEYS

A. Topographic maps

Modern topographic maps and geodetic control of the USSR available in this country, are limited to that material originally captured by the Germans, and, in turn captured by the Western Allies during and after the fall of Germany in 1945.

The extent of available, reliable, larger-scale map coverage coincides substantially with the densest area of first-order, geodetic control which is supplemented by close-knit, lower order networks.

Of the out-dated Tsarist mapping material and survey data prepared prior to 1917, there is a considerable amount in the Army Map Service archives. While the work accomplished covered a fairly extensive area of European USSR, the results were not particularly significant in the light of present-day precision requirements.

Geographically, the general outline of the area for which there are fairly reliable topographic data is best defined as a pie-shaped segment of European USSR, extending roughly from a northern vertex at the western end of the White Sea, fanning out southward to the forty-third parallel, including the area between the western end of the Black Sea and the west coast of the Caspian Sea.

A strip of first-order geodetic control, however, does extend eastward beyond the Urals, roughly between the fifty-second and fifty-sixth parallels. Being a prime geodetic network, this control is generally only valuable for smaller-scale map compilation.

Reliable reports indicate that an extensive geodetic and cartographic program has been underway in the USSR since VE-day, but nothing of practical value has broken through the cloud of Bolshevik obscurity.

B. Other maps and charts

The most useful air charts of western USSR are those published by the USAF Aeronautical Chart Service—*World Aeronautical Chart* series at 1:1,000,000, for medium-scale coverage; the *Aeronautical Planning Chart* series at 1:5,000,000, for general planning; and the USAF *Equidistant Chart Centered near Sverdlovsk, USSR* at 1:24,327,708, for highly specialized use. Other charts designed for special purposes or giving complete coverage have been published by the USAF Aeronautical Chart Service, the U. S. Hydrographic Office, the Army Map Service of the U. S. Army Corps of Engineers, and the British, Geographical Section, General Staff (GSGS).

Hydrographic charts of western USSR waters have been published by the United States, Great Britain, Germany, Finland, Latvia, Estonia, and the USSR. Soviet charts are based on the most recent original surveys and corrections. Consequently, they are recommended exclusively, except for the supplementary German, Finnish, Latvian, and Estonian charts of the Baltic. The non-Soviet material has been included because of both the recency of the Soviet advances along the Baltic and the Soviet policy of withholding detailed information. Soviet charts are reliable for what they show, but some information is known to be withheld. American and British charts are based

on various sources, which are in most cases older, unrevised, Russian surveys.

One hundred and six selected subject maps, ranging in scale from 1:100,000 to 1:30,000,000 and varying in date from 1925 to 1947, are described under the following headings and sub-headings:

1) Physical:
   - General
   - Geologic
   - Ice
   - Climate and vegetation
   - Soils
   - Military
2) Political-Administrative
3) Peoples
4) Transportation, Telecommunications, and Power:
   - Railroads, waterways, and time zones
   - Roads
   - Telecommunications
   - Power
5) Economic

In addition, a section on atlases lists and describes fifteen atlases, including the *Bol'shoy Atlas Mira* (Great Soviet Atlas of the World), Volumes I and II.

One hundred-thirty plans for eighty-nine cities are listed and described. For some cities, several plans are given since each supplies some pertinent data not found on others. The plans show hydrographic features, roads, and railroads. On some of the plans, additional features are also shown. The plans vary considerably in date, scale, and clarity of presentation.

FIGURE I-24
POPULATION DENSITY
JANIS 40

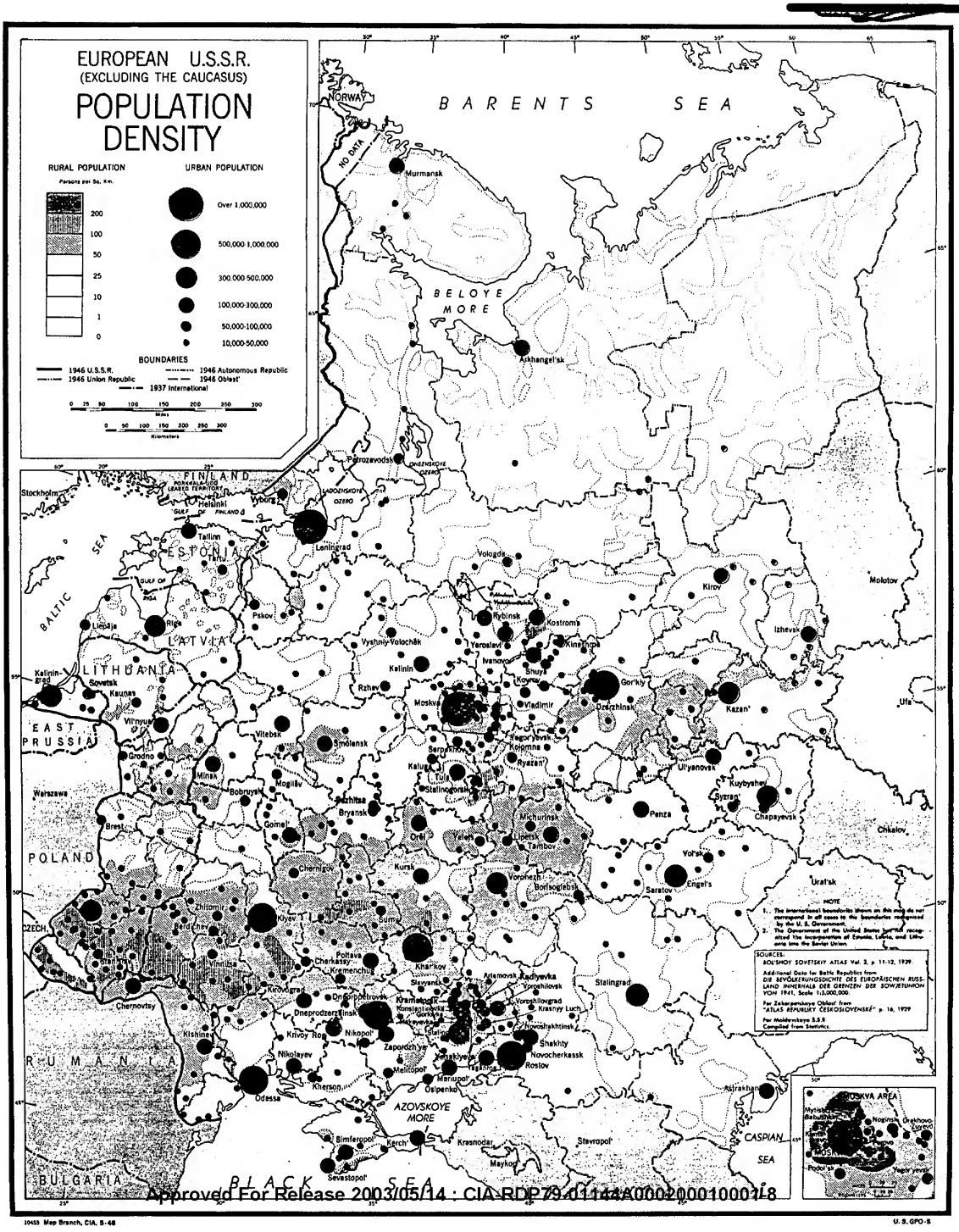

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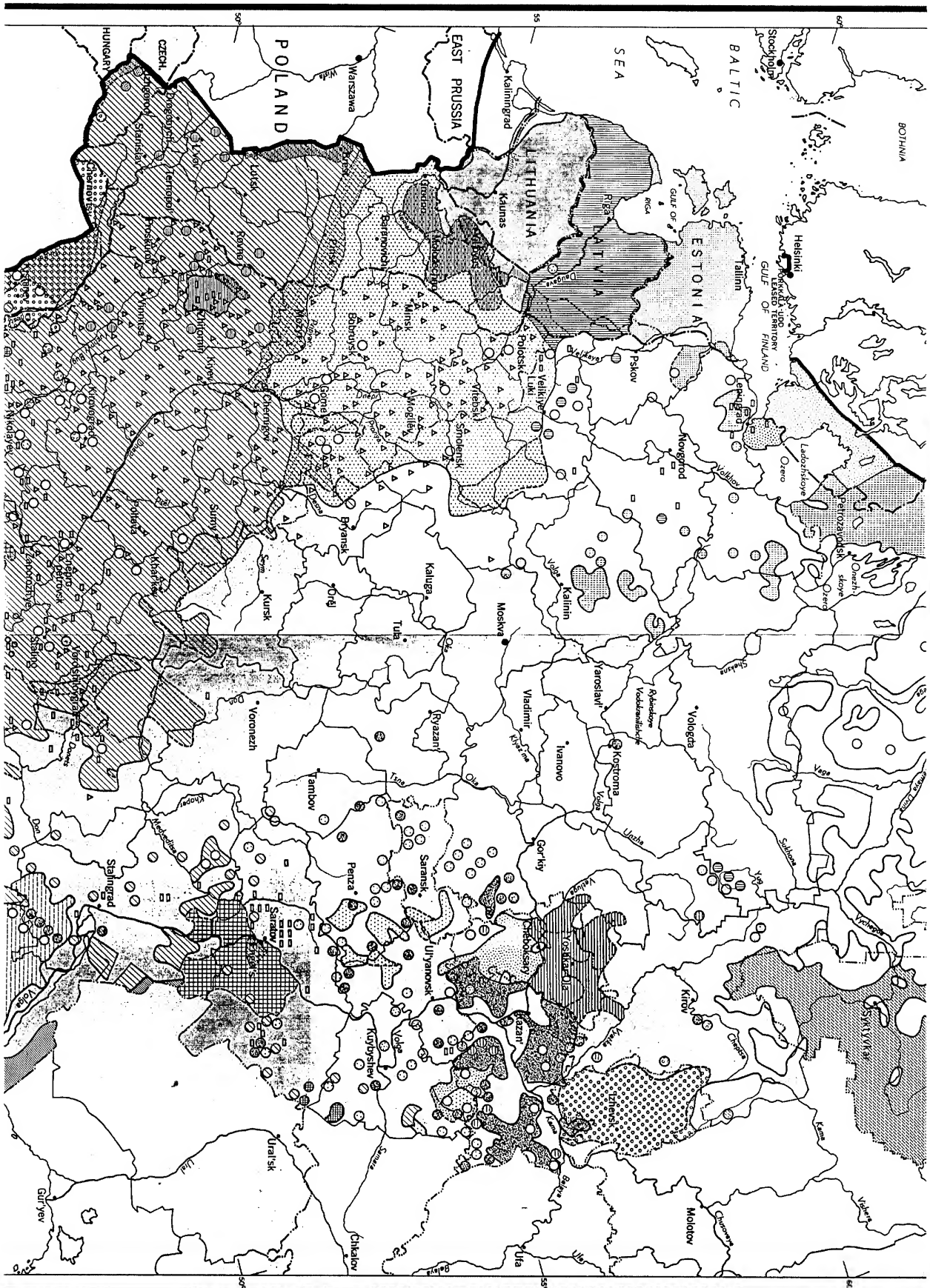
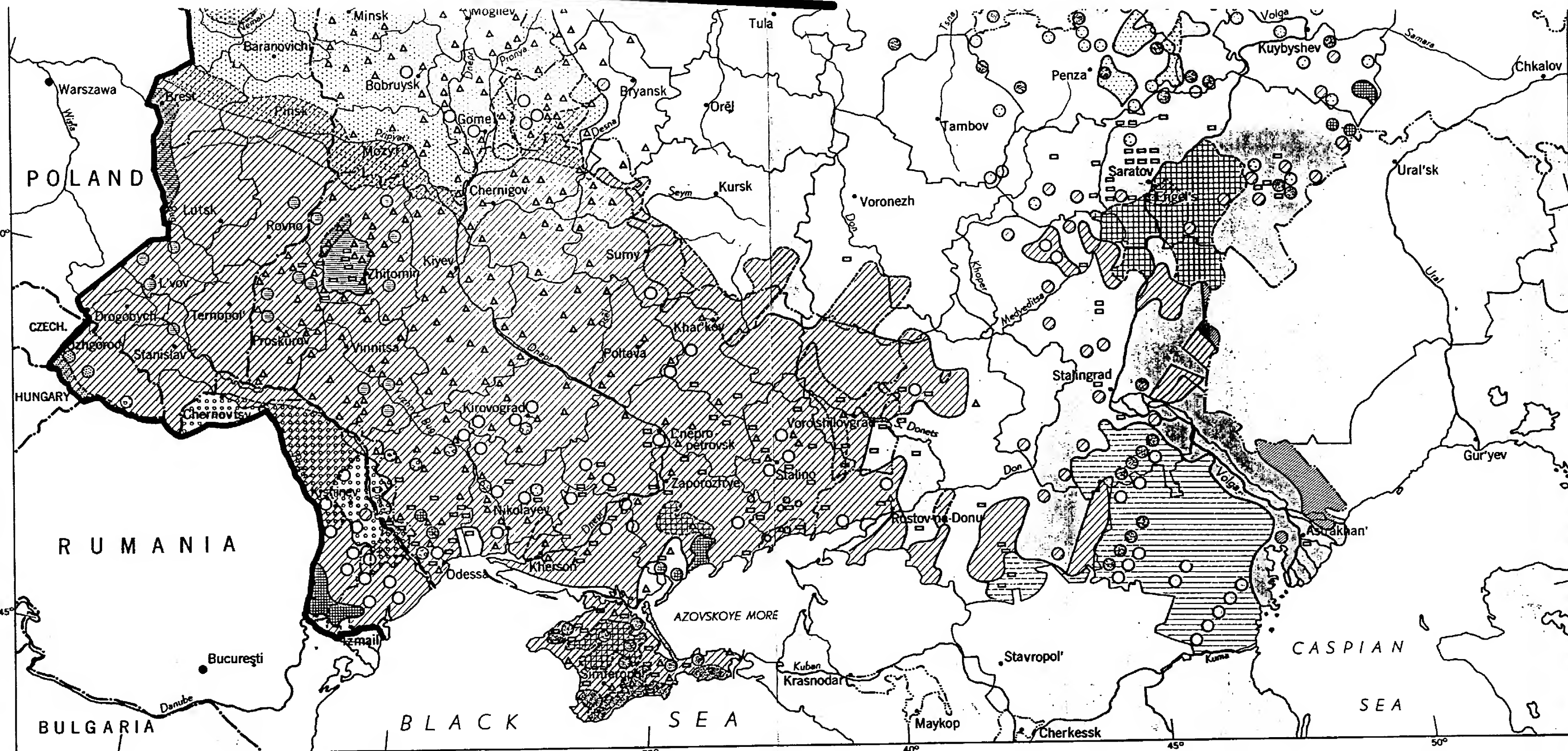
FIGURE I-25
ETHNIC GROUPS
JANIS 40





EUROPEAN U.S.S.R. ETHNIC GROUPS (BEFORE 1939)
(EXCLUDING THE CAUCASUS)

SOURCES: *VÖLKERKARTE DER SOWJET-UNION* (European part) 1:5,000,000 Reichsamt für Landesaufnahme, Berlin, 1941
Data for Czechoslovakia from *ATLAS REPUBLIKY ČESKOSLOVENSKÉ*, 1935 plate 16, 1:5,000,000

RUSSIANS (Great Russians)
WHITE RUSSIANS
UKRAINIANS
POLES
BULGARS
MOLDAVIANS & RUMANIANS
LITHUANIANS
LATVIANS
ESTONIANS
FINNS
KARELIANS
LAPPS
KOMI (Zyrians)
UDMURTS (Votyaks)
MARI (Cheremis)
MORDVIANS
SAMOYEDS (Nenets)
TATARS
CHUVASH
BASHKIRS
KAZAKHS
KALMYKS
MAGYARS
GERMANS (Not shown west of 1937 boundary)
JEWS (Not shown west of 1937 boundary)
GREEKS

ADMINISTRATIVE BOUNDARIES 1946

U.S.S.R.
Oblast; Kray
Union Republic (S.S.R.)
Autonomous Republic (A.S.S.R.)

ETHNIC BOUNDARIES (APPROX.)

International, 1937
Dominant group
Mixed group

NOTE: The international boundaries shown on this map do not correspond in all cases to the boundaries recognized by the U. S. Government.

0 100 200 300 400 MILES
0 100 200 300 400 KILOMETERS

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U. S. GPO-S

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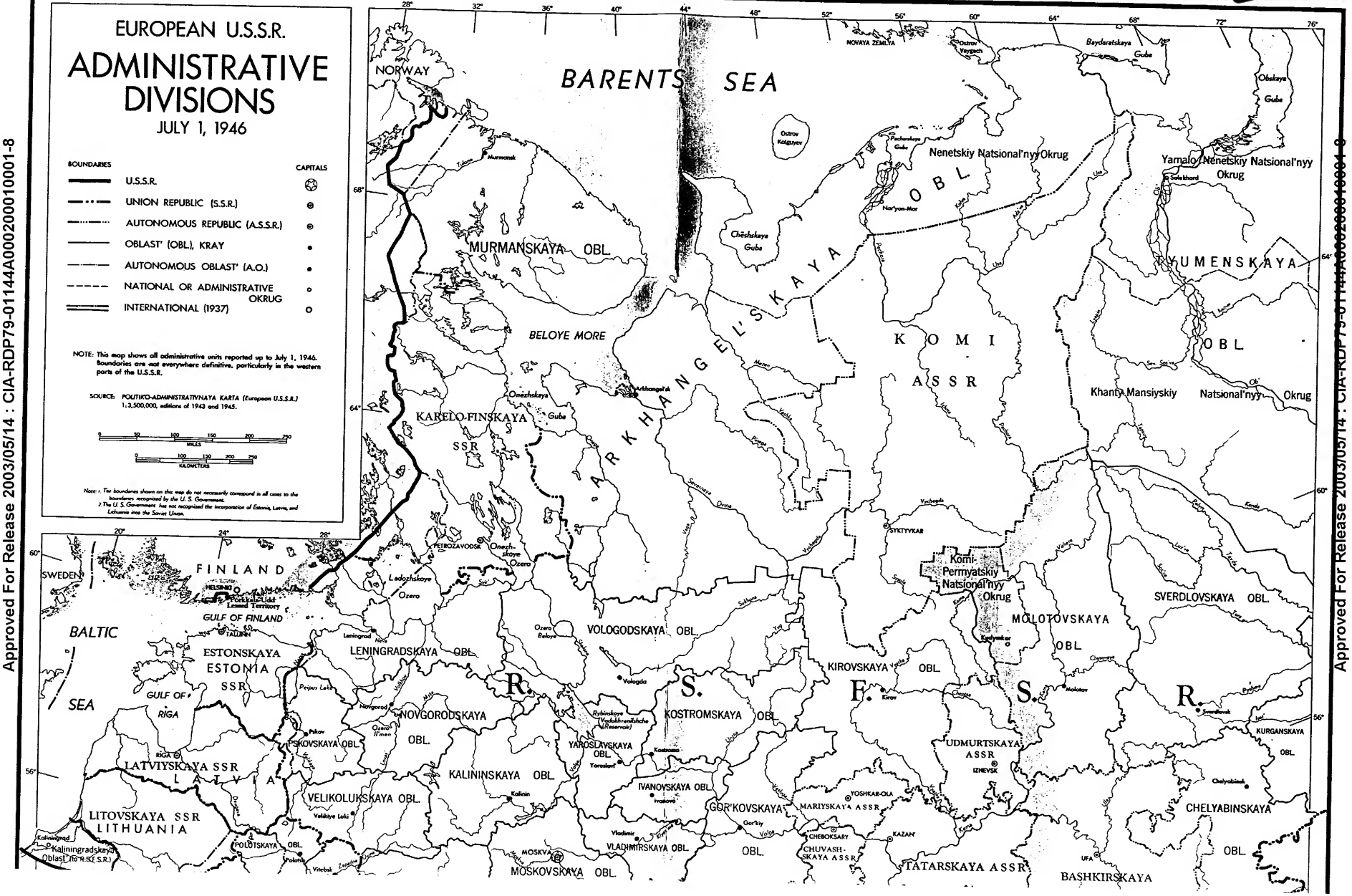
FIGURE I-26
ADMINISTRATIVE DIVISIONS
JANIS 40



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Produced by

Department of State
Department of the Army
Department of the Navy
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Published by

THE CENTRAL INTELLIGENCE AGENCY

WASHINGTON, D. C.

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U. S. GOVERNMENT PRINTING OFFICE
2679—STATE—1949